July 1928

Electrical Manufacturing

Vol. 2 A Gage Publication No. 1

HERCULITE

-an unusual resinoid of superior strength

IN the effort to help electrical manufacturers to lower production costs, we have produced HERCULITE —a tremendously strong, shock-resisting plastic.

HERCULITE possesses every economical characteristic of synthetic molding compounds; and while not recommended for intricate moldings, its flowing point being lower than the average, HERCULITE is more advantageously used for the great bulk of molding.

Finish, uniformity, accuracy, are all readily obtained with HERCULITE, and its great mechanical strength gives it preference for most molding needs.

Let us work with you on your molding problems; we feel sure HERCULITE will solve many of them, and would like you to test it.

The Colasta Co.

Hoosick Falls, N. Y.

-it's shock-proof

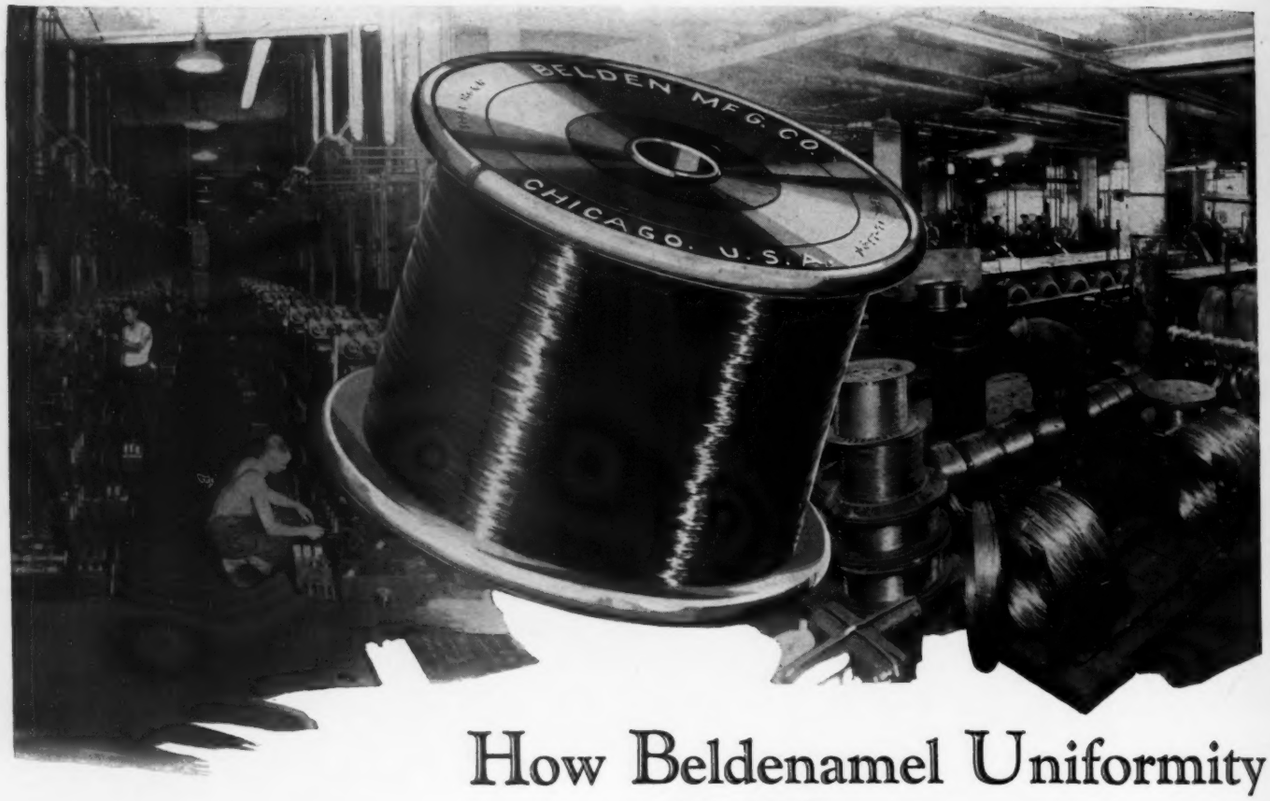

Illustration at right shows section of Belden Wire Drawing Mill where Beldenamel Magnet Wire is drawn and annealed.

The picture above shows a row of Belden Enameling Machines. It is through the accurate control of every step in its manufacture and painstaking care in each process that the remarkable uniformity of Beldenamel is maintained.

How Beldenamel Uniformity Is Maintained

To secure and control uniformity Belden have developed their own special process of drawing and annealing wire. Every foot of Beldenamel Wire is drawn in Belden's own wire mills.

To control uniformity in the enamel Belden collects raw materials from the ends of the earth for the enamel solution. The enamel is prepared by Belden chemists with the most exacting care according to a secret formula.

By a unique Belden process the thickness of the wall of enamel is automatically controlled with precision during application, thus maintaining a uniform size in the completed product.

It is the remarkable uniformity of Beldenamel, secured through painstaking care in each step of its manufacture, that makes it so popular for an almost unbelievable range of uses, where accurate winding is of vital importance.

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Beldenmold
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Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
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Heating fluids, solids, air! Heating tanks of compounds... industrial equipment... special processes, heating anything from metal to grease... heating railway cars; here you have a few of the hundreds of jobs on which Chromalox Units have been operating three and four years *without quitting.* ★ Over 150,000 Chromalox Strip Heaters are in service on over 120 railways—the toughest kind of a job!

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E.Mfg. 7-28

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*Signed*_____ *Position*_____

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Where Distribution Begins

By MAGNUS W. ALEXANDER
President, National Industrial Conference Board

DISTRIBUTION involves much more than transportation, marketing and handling. To many, distribution means simply the disposal of their own output, that is, the problem of marketing their own goods. Market analysis and salesmanship, it is believed, can solve the problem. We must examine the issue, however, not from the standpoint of the individual producer alone, but from the broad viewpoint of national economy. It is seldom recognized that the distribution problem goes much deeper and in fact has its roots in production. Faultily planned production cannot be rectified, although in part it may be corrected, by even the most excellently planned marketing program, a fact evidenced in the failure of many carefully designed and strongly financed advertising and sales campaigns. There can be no over-production because there is practically no limit to consumption, with the important proviso, however, that there is an infinite and ever increasing variety of commodities and in view of the vast potential markets to be opened up by the gradual improvement of living standards of the world's population now living on the fringes of what we choose to consider as civilization in Europe and in America. But there certainly can be over-production of any one given variety of commodity at any given time. It is in the planning of what to produce that the solution of the distribution problem lies.

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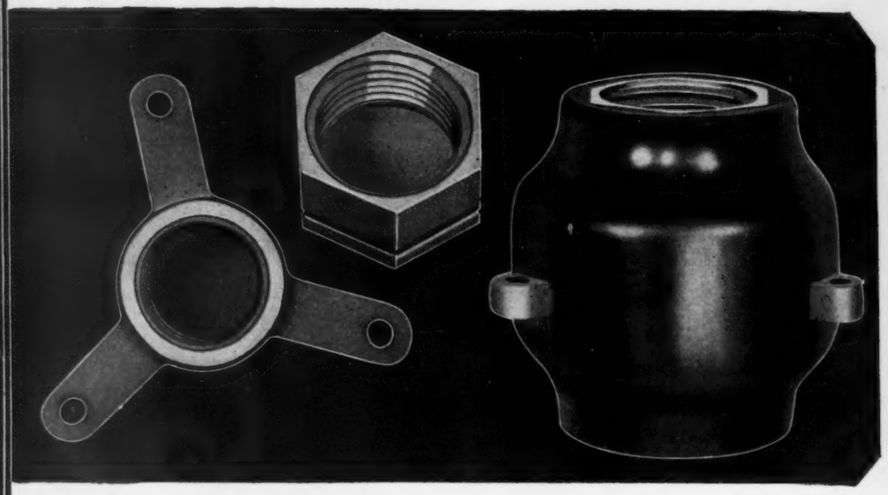
Simplified, Low Cost Production via Die Casting Plus Reynolite



Results in efficient, weather-proof condenser for Super-Ball Antenna

TWO die castings, each produced in one swift operation, are combined into a single unit by a housing of moulded Reynolite also formed in a single operation—and this compact little condenser is complete, ready for use. No further machining or assembling is required.

The die castings used are quite simple in design, though both have cast-in, internal threads. Their strength is such that the pressure employed in forming the composition housing does not distort them in the least.

The finished assembly is subjected to considerable strain as well as all kinds of weather conditions — sleet, snow, rain and intense heat and cold.

The use of die castings in combination with other materials and with other production methods is covered in this non-technical handbook. If you haven't a copy, write for it today.

Perhaps you can employ similar "short cuts" in producing parts of your product. Milwaukee Die Casting Technicians can help you decide.

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DIE CASTINGS AND BEARINGS

GAIR

SHIPPING CASES

Corrugated and Solid Fibre

Six Box Board Mills with an Output of T

THE hidden strength of a Corrugated Case lies in the line of greatest resistance, i. e. ∿∿∿. The slightly flexible continuous arches, with crown and feet firmly cemented to walls of Jute Liner give you a combined arch and truss formation which is the most unyielding known. But buildings have collapsed and bridges have gone down because the science of construction was betrayed by false materials.

The Straw Paper that forms the arches in Gair Corrugated Cases comes from our Quincy Mill, and the raw material is brought in from the surrounding wheat fields of the middle west. The manufacture of Gair Straw Paper is closely supervised to get the springy stiffness that takes up impact. No substitute for Straw can properly hold the fluting or show the resistant qualities of good Straw. Our Jute Liners are produced on Gair Board Machines at our Thames River Division, where they run under regulations that uphold the merits of the inside and outside of Gair Corrugated Cases.

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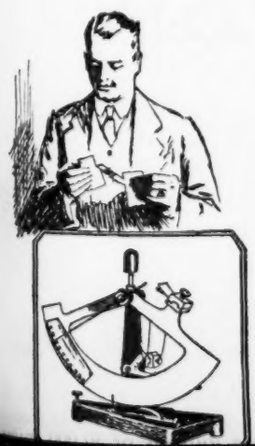
GAIR Solid Fibre Cases have a fine external finish and are made of sound substance. Their quality is safeguarded from the Kraft that goes into the Mill's beaters to the strength of the rust-proof staples that join them. They are built sturdily and with a severe eye upon waste in manufacture. The packer enjoys carefree shipping economy and knows that the Gair Case contributes to his good service. But—perhaps there is a loop-hole for further saving. Is the physical structure of your Solid Fibre Case exactly suited to the contents? Does the shape lend itself to stacking in neat, firm tiers in your warehouse? Does its measurements facilitate handling in transit so that standing on sides or ends will be avoided because it is given an obvious base? These are questions that our Engineers are ready to answer.

A former Fellow of the Mellon Institute of Industrial Research heads the Shipping Case Division of our Department of Design. He is a Chemist and Engineer of wide experience and knows and watches the integrity of the substance that goes into the Case, as well as the resistance of its structure to strain. Under him, a staff devises the interior fittings for very special Corrugated or Solid Fibre Cases to meet peculiar requirements.

Sixty-two years' experience in the manufacture of Paper Products and the six Paper Mills and Fabricating Plants linked by short distances between New York and Chicago that have grown from the seedling factory that began in a small loft in 1864 are evidence of the sincerity and searching self-criticism with which our goods are produced.



GAIR TAPE is an example of the care with which we try to perfect every detail. Every lot of it is tested in advance by the special machine illustrated. To prove its strength yourself, glue a strip of it to a strip of any other tape, as shown above, and pull!

COMPANY

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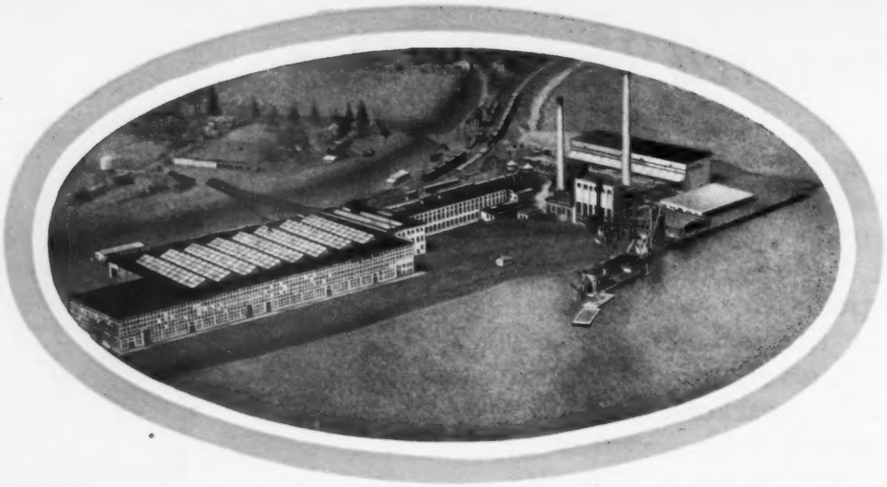

Our Thames River D vision, comprising Bo Board Mill and Corru gated Case Depart ment stretches one quarter mile along th Thames River abov New London, Conn The plant stands fore most in modernity o structure and equip ment.

Corrugated Case Finishing Department of Robert Gair Company's Thames River Division.

Our Piermont Division fronts the Hudson River one-half mile at Piermont, N. Y. It consists of an important Box Board Mill, Fibre Shipping Case Department and a Folding Carton Plant, supported by large and excellently appointed printing and lithographing rooms.

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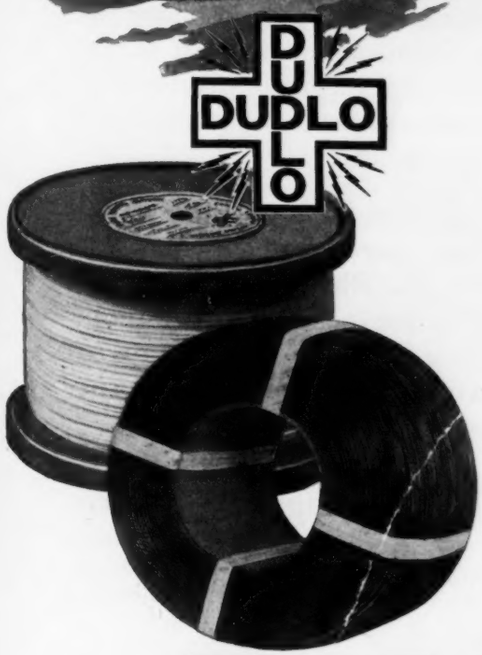
Six Box Board Mills With an Output of 1200 Tons Per Day



When dependability Counts!

A lone plane speeding into the dusk, the nearest land hundreds of miles away.

Three daring flyers wagering their lives that *dependability* has been built into every unit of the straining ship.

Their courage is fortified by the knowledge that the builder of the plane has used nothing short of the best materials the world affords.

Electric energy produced by wire-wound armatures and fields must pass, uninterrupted, through wires to coils, ignition system, lights and instruments.

A wire failure in one of these vital units may instantly change a history-making flight into fatal disaster.

If your product is one using magnet wire or coils, the only safe course is to adopt a reliable source of supply such as Dudlo offers---where dependability counts.

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Improvements in finished products are:

Better finish.

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Enhanced performance based upon accuracy and simplicity of design.

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Improved performance as a result of detail improvements possible with the Stewart Die Casting process.

Stewart engineers are specialists in die design and in the adaptation of products to production as die castings. Their services are available to manufacturers without charge. The Stewart plant is the largest in the world devoted exclusively to die casting. Automatic machinery, principally of Stewart design, and an organization highly trained in the Stewart process insure economy, accuracy and unrivalled standards of service.

THIS statement is true of practically all industry today — and the situation results from intensive development in products and equally intensive reduction in costs.

Stewart Die Casting service plays a major part in creating this situation for Stewart service reduces costs and helps improve products for hundreds of manufacturers in widely varying fields of American industry.

Find out what Stewart Die Casting service can do to simplify *your* manufacturing, sales and service problems. Blueprints or samples will enable Stewart engineers to furnish complete information on the advantages of Stewart Die Castings as applied to your specific requirements.

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Through forty years of service to all industries, SCRANTON Moulding has set new standards of quality. Even in this mechanically marvellous age, SCRANTON accuracy, uniformity and finish are things to wonder at. This is due mainly to the care expended on SCRANTON moulds,—the cradle of fine moulding. In Bakelite, "PHENOLIC" or "LA-CANITE," the finished casting will be found superior.

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SCRANTON MOULDS

retained by us are always repaired, insured and renewed if necessary, without additional expense to the customer.

THE SCRANTON BUTTON CO.

Plants located at **SCRANTON, PA.,** *and* **AUBURN, N. Y.**

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THE reason that Gage Direct Mail Stencils contain more names and are more correct than other compilations —public or private—is because more time and money are spent upon them.

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Complete Price List covering addressing and mailing will be sent on request.

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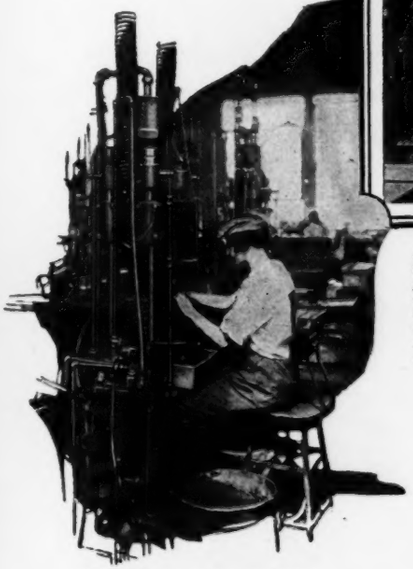
If you need custom-molded parts of proved reliability and economy, telephone your nearest G-E office.

A production aisle in the hot-molded department. Note that the most modern equipment is used to decrease manufacturing costs by scientific mass production



This trained operator molds thousands of intricate pieces every day. Hundreds of such operators are needed to meet the demand for G-E Textolite Molded

An aisle in the cleaning department. After cleaning, the beautiful polished pieces are ready for packing

GE Textolite Molded

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The "big things" with us are **doing every job correctly** and retaining the good will and confidence of our clients.

American Insulator Corporation

New York Office—52 Vanderbilt Avenue

Plants at New Freedom, Pa.—Danbury, Conn.

In the German practice of economy Rust prevention is paramount ~~

German manufacturers know that in a struggle to capture world markets and hold them their products of iron and steel must first have good appearance, then utility, and above all that utility must have long life.

Udylite holds a formidable position as the accepted rust proofing agent in the European market.

Edward Feldman of Berlin, Germany, whose plant and laboratories are shown above, is rapidly establishing Udylite Process plants throughout France, Germany, Switzerland and Austria.

Wherever rust and corrosion take their toll—there Udylite serves. Wherever iron and steel products are made in any part of the world, Udylite is used as a positive rust proofing agent—applied electrolytically to the base metal it serves a two fold purpose—utility to prevent rust and a beautiful silver-like finish to please the eye.

Write us—it will cost you nothing to learn what Udylite is doing in over four hundred other plants—some of which may actually parallel the product and operations in your own.

"The Process Is Available to All"

Udylite
RUST PROOFS

3220 Bellevue Avenue, Detroit, Michigan

AFFILIATED WITH GENERAL CHROMIUM CORPORATION

DURO CHROME

The Durable Chromium Plate

No other plating approaches Duro-Chrome in characteristics of such untold value; characteristics that create a finish of permanent beauty with great resistance to wear, heat, acids, rust, and corrosion. Duro-Chrome has the appearance of platinum, and like platinum it will never stain or tarnish.

Used as a plating on hardware, kitchen ware, electrical utensils, plumbing fixtures, etc., it offers an ideal finish, with a co-efficient of friction so low that practically no substance will stick to it. No abrasives or polishing is required—simply wipe the surface with a cloth.

If the base metal on which Duro-Chrome is plated is hard you cannot scratch the plated surface with a file.

Used as a bearing surface on reciprocating parts, plug gages, snap gages, and molding dies the metal which it covers is protected indefinitely.

We solicit an opportunity to prove the value of Duro-Chrome by plating your samples for you. Send your blue prints for quotation on production orders . . . Some manufacturers may prefer to apply the process in their own plants. Satisfactory arrangements can be made to meet such preferences.

Write for Full Particulars

GENERAL CHROMIUM CORPORATION

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More than Fifty Manufacturers of General Purpose Motors Use Ball Bearings

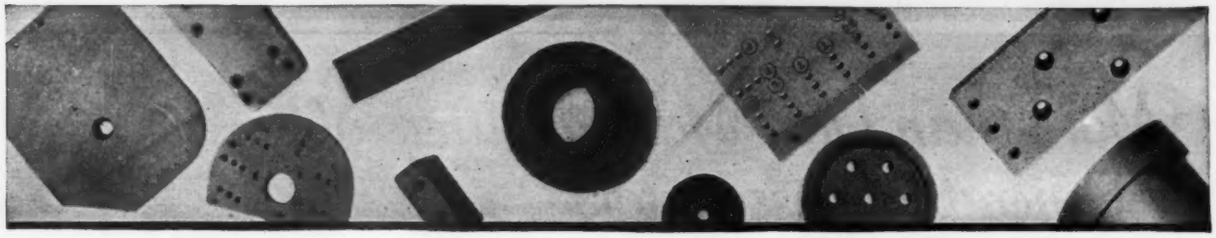
U. S. Electrical Mfg. Company is one of more than fifty electric motor manufacturers who supply a series of general purpose electric motors with ball bearings as standard or optional equipment.

U.S. ELECTRIC MOTORS in these grinders, equipped with New Departure Ball Bearings, were built for the very severe operating conditions found in railroad repair shops.

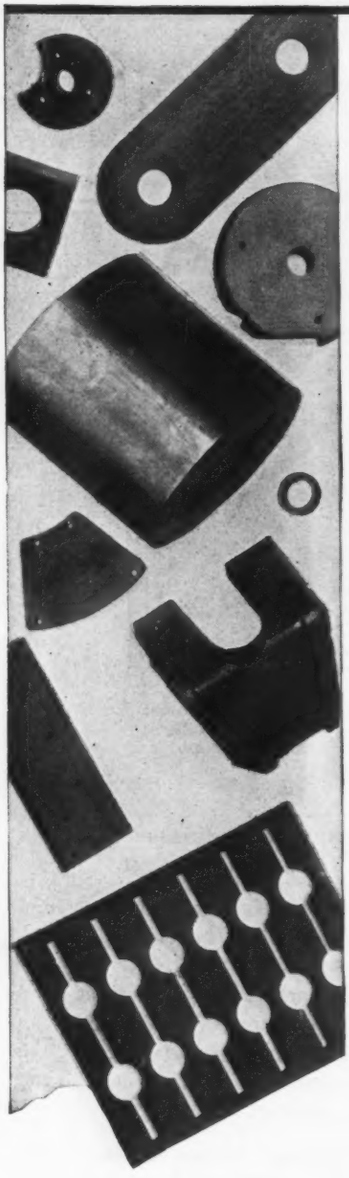
Such service calls for exceptionally heavy, rugged construction which is materially assisted by the use of ball bearings having not only high capacity to resist heavy loads imposed by grinding machinery but also longest life. Ball bearings are free from measurable wear and the bearing seals remain effective for years, thus keeping motor windings as well as the bearings free from grinding dust.

Further reasons why electric motors should be equipped with ball bearings are fully outlined in two booklets published by our Engineering Department. "Booklet K" is of interest to designers. "Cutting Your Cost" is of interest to owners, operators and maintenance men. Either or both sent upon request.

The New Departure Manufacturing Company, Bristol, Connecticut; branches at Chicago, Detroit and San Francisco.



Moulded into thousands of shapes



ASBESTOS EBONY

Lends itself to a great variety of uses

THE uniform, monolithic nature of Johns-Manville Asbestos Ebony results in a material which can be used where precision must be combined with high dielectric resistance, structural strength and resistance to moisture.

Moulded into thousands of shapes Asbestos Ebony is used in a wide variety of electrical machinery and equipment.

J-M Asbestos Ebony in moulded form gives the same service which has resulted in its use for huge switch panels. We welcome inquiries from manufacturers of electrical devices of every sort. We are ready at any time to estimate on moulded material.

Address Electrical Section, Johns-Manville Corporation at New York, Chicago, Cleveland or San Francisco.

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MASTER *of* ASBESTOS

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ASBESTOS EBONY

JUL 20 1928

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Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 2 JULY - 1928 Number 1

The ENGINEER in INDUSTRY

By W. S. Rugg

Vice-president in Charge of Engineering,
Westinghouse Electric & Manufacturing Company

ENGINEERING has become the basis of our present civilization. Not many years ago the word *engineer* applied usually to only a few activities. The ordinary man understood by the word *engineer,* a man operating a steam engine. Some knew of the civil engineer but, generally speaking, to the public, this meant a surveyor. Engineering as a business was not known.

The technical university course, as we now see it, was unknown. Contrast that time with the present. A profound change has taken place in society in general and especially in the United States. We now find engineers everywhere and almost everyone whom we meet can talk intelligently on engineering subjects.

This development of what might be termed an "engineering consciousness" on the part of the public in this country, together with resulting specialization in engineering by so many men, is the underlying cause of our phenomenal prosperity—our enormous productivity—our short hours and leisure time—the universal use of luxuries which have become necessities.

The engineer has pushed his way into all human activities. The young man of thirty years ago became interested in engineering; he demanded engineering training and in answer to this demand the schools organized technical courses. He went out and entered into business life of some kind, not as a leader or an executive at that time, but a doer. Gradually he began to be recognized as a factor in all human activities; he began to profoundly affect our civilization.

Engineering Has Transformed Business

THIS has gone on until now he has transformed our entire business life; he has transformed all human activities. Because of this engineering slant, this engineering method of doing things, we have in this country an unheard-of prosperity. Why is this? Why was engineering the key, as it were, to open the door to this wonderful development of modern society? Why has engineering come to be recognized as the foundation of our modern life? One reason there is. An engineer has to do with machines. He is one skilled in the art of designing, building and applying machinery.

Now, a machine is something which does work. The dictionary says that a machine is *any contrivance* to produce, increase and regulate the power of motion so as to do work. Note the words *any contrivance.* Note the broadness of their meaning. A machine is *any contrivance* to do work. This touches human life at one of its most important practical points.

From time immemorial the great struggle of the human race has been to spend less time at work and more at play. This is not a struggle against the sentence "In the sweat of thy face shalt thou eat bread," but against the inefficiencies of doing it. This has been the engineer's job—a struggle to overcome and to do away with the inefficiencies of our life.

Engineering and Future Development

THIS thought has especial interest to us who are engaged in electrical engineering. Electricity is the form of power best adapted to the use of human endeavor, so it has come to be used in preference to all other forms of power; in fact, we transform all other forms of power into electricity before we think it fit for human use. We have, I think, more transmission lines than all the rest of the entire world put together. We use more power per man. The end is not yet. We are going on—this country will be gridironed with transmission lines—the water power regions of the West, South and Northeast will be linked with the coal and oil of the mid-continent, all feeding into enormous networks of distribution lines until every man, woman and child in this country will have this universal slave at his command to do away with manual labor.

I believe that the successful accountants of the future will be equipped with some technical training; the legal department will have an engineering concept; the treasury department of the future will of necessity have to have some engineering training. So also the Works Manager, Superintendent, Foreman; in fact, the workman himself.

In other words, these producing organizations now have and will have to have so much to do with engineering—engineering will premeate their processes so much—that everyone engaged in any phase of the work will do that work better if he has a technical training of some sort. So my conclusion is that the place of the engineer in industry is everywhere and that as the engineer has been and is solving the material processes of production, so in the future he should and will move into all other departments of industry. He is the man skilled in doing away with inefficiencies; this has been and is his job. This has been well done in the material processes but largely remains still to be done in some of the less material processes of our industrial organizations.

The New Competition

Our big problem is in deciding which elements of the new competition we should keep up with and which elements we should vigorously try to hold this side of the danger point

THE basis of American prosperity is high efficiency, high buying power and high standard of living. The prosperity of the manufacturer and merchant depends on the prosperity of the wage-earner, and the prosperity of the wage-earner depends on that of the manufacturer and merchant. The wheels of American prosperity keep on going at a good speed as long as there is nothing seriously affecting efficiency, buying power or our high standard of living.

The new competition—that is, the competition of industry with industry—touches our economic life at every one of these points. "Touches" is, I am afraid, a very mild word—I ought to say "crashes into" instead. If the new competition has been as disturbing as that, how is it that our prosperity has soared to the highest levels in history at the very time when the new competition has been becoming fiercer and more complicated every day? The answer is that the new competition has become an overwhelming influence towards higher efficiency, higher buying power and higher standards of living. In fact, it is probably the most important favorable influence on these factors today.

But American business is living in a fool's paradise if it does not realize that the new competition may also be the most important unfavorable influence on these factors—that just as the new competition, to a vital degree, has given us our prosperity, so also may it take it away. And when I speak of the new competition I include also the old competition, because they become almost indistinguishable in their interaction and in the way they intensify each other.

The greatest danger which American prosperity faces today is that the new competition will get out of hand, will take on warped and destructive economic forms, will become an economic poison instead of an economic stimulant. The new competition can not only raise the efficiency of production and distribution, but it can also depress it; not only increase buying power, but also decrease it; it can not only advance the standard of living, but can also retard it.

It is not easy for us to understand this, because our minds are too much under the black and white habit of thought. It is so much easier for us to think of something as being either all black or all white—either all good or all bad. But the new competition, like almost all other economic influences, is composed of tendencies both good and bad. Installment selling, for instance, is neither what its "pointers with pride" nor what its "viewers with alarm" think about it. Hand-to-mouth buying is neither what the manufacturers nor what the retailers say about that method of purchasing.

Forgetting for a moment individual industries and the fortunes of war, the economics of the nation will depend on how well we can distinguish between the good and the bad in the new competition. And it is not even as easy as that, because the same trend or development or competitive device may be good up to a certain point and dangerously unsound when carried beyond that point.

So that our big problem is not really in keeping up with the new competition, but in deciding which elements of the new competition we should keep up with and which elements we should vigorously try to hold back. And here is where our economic machinery grows so complex as to be almost beyond the imagination and certainly beyond the ordinary control of the men who are making it. Who can decide how far is good? How can we decide? What can we do about it when we do decide?

Our machinery for regulating the old competition is jumbled enough, but at least we have some idea of controlling that vague something we call "unfair competition." But when it comes to the new competition, the competition between industries, the competition between the different factors in the chain of production and distribution, the competition between commodities—what is there to guide us? Let us pretend for a moment that we have learned how to keep the balance between competition and cooperation within each industry; that we have learned how to protect the competitive balance between big business and little business. But when it comes to the new competition, we can not even pretend that we have any conception of the principles of keeping a balance.

Without going into the details of specific examples, I should like to bring out the reality and gravity of the problem. It exists and is becoming more acute in every industry. The textile industry, which I shall use as an example, may, at times, have suffered a little more acutely than some of the others, but the kind of pain is the same in all industries. The new competition between cotton, silk, wool and rayon presents a pretty picture which has been widely exhibited by the new competition enthusiasts. We can explain it by saying that because of style trends and the higher buying power, cotton and wool have been losing in the new competition to silk and rayon. Rayon, as it improves in quality and serviceability, will probably put the silk industry under a terrific strain. Wool has in the past two or three years

NO argument should be necessary to convince electrical manufacturers that they are face to face with "the new competition," when it is recalled that more than 100 industries, or business groups, are waging cooperative market development campaigns against 19 out of a total of 33 accounts in the budget system of the American home. This new competition, as Mr. Cheney aptly expresses it, "crashes into" every phase of our industrial and commercial life. The electrical manufacturing field is not an exception. It is essential, if this field is to hold its own and to forge ahead, that production and marketing executives all along the line understand this new competition and learn how to deal with it.

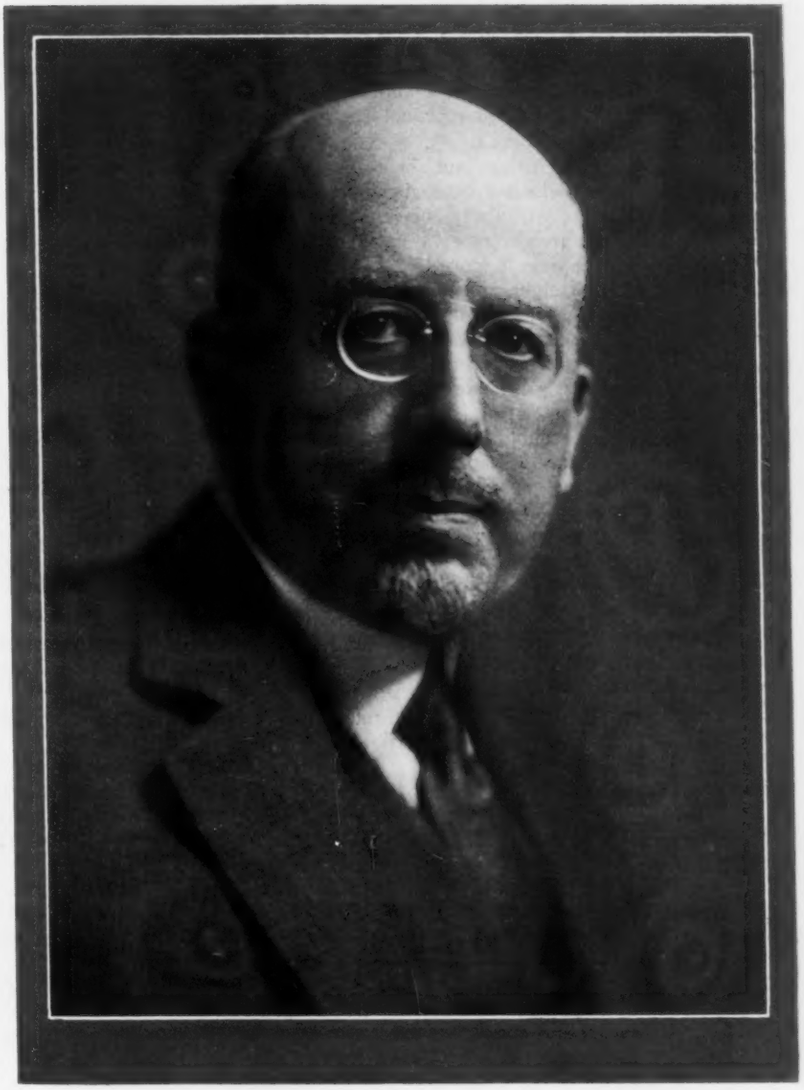
THE EDITOR

Must Be Controlled

By O. H. Cheney

Vice-President, American Exchange Irving Trust Company, New York

This article is taken from an address made by Mr. Cheney at the Convention of the Chamber of Commerce of the United States, May 10, 1928



WE have already made tremendous progress in the new cooperation. But there are still too many spite fences in American business. The time has come to destroy them. We must learn more of the relations between industries and how they may be guided into cooperation and mutual understanding.

O. H. Cheney

been up against fur in the important women's coat field. The whole textile industry has been suffering from the low yardage per garment in women's wear because of the present styles. In the men's field, purchasing is lower per capita than it used to be and shows little tendency to go higher. In the manufacturing industries which use textiles, conditions are similarly chaotic and in a constant state of flux. The cloak and suit industry seems hopelessly beaten. All the clothing industries have been complaining about the way the consumer has been spending money on such things as installment automobiles rather than on clothes.

The various textile industries have awakened to the new competition, and with a commendable spirit of economic courage each has begun to fight for its share of the textile dollar, and all are fighting for their share of the consumer's dollar. Cotton and wool are trying to rehabilitate themselves — by wise means and some means not so wise— and have used rayon to help. Wool during the past season has been fighting back against fur for the women's coat market and seems to be making some headway—so that the fur industry is getting worried and seeking ways and means to keep its hold. At the present time the textile industries appear to be convinced that their salvation lies in institutes—three of the four major textiles are now represented by such bodies, and the silk industry is seriously debating it. The women's wear field has been for the past three years making a strong effort to bring back more feminine styles and a greater demand for yardage, and may succeed a little this year, while the men's clothing industry appears so far to have made no progress in its attempts to get men to dress up.

That, then, is about where the textile industries find themselves in the new competition. But what they have realized is not enough—they must dig deeper into causes and effects —and they must be frank with themselves. What has happened to the economics of each industry? Just how is each industry affected by temporary defeat in the fortunes of war of the new competition and by temporary victory? And how is the industry as a whole affected by permanent defeat and by permanent victory? Can industries really be killed? And should some industries be allowed to die off?

And, leaving the industries with their problems for a moment, let us ask ourselves even more vital questions. What is the effect of the new competition in the textile field, for instance—or in the food industry or building industry, for that matter—on the consumer? Does the consumer gain or lose—and what? What happens to the worker whose very livelihood depends on his industry? What happens to towns and States and whole sections of the country which so often depend on particular industries? And what happens to the capital invested? In this connection, it is significant

that when the new competition in its many phases really hit the cotton industry, consumer demand decreased, cotton spindles stopped working, hands were laid off. The New England mill towns had to tighten their community belt, as it were, and wait patiently for better times. The cotton-growing districts of the South also suffered from the slackening demand. And for a while, North and South kept themselves busy arguing about their relative merits for cotton manufacturing. Recently both North and South have realized that they are both vitally dependent on the same industry and that it would be better for both to work together than to argue. If cotton is to remain king, there must be no civil war in his dominions.

Not a day passes but brings out some example of intersectional competition, whether it be about climate or about wage-rates. But there will always be intersectional competition so long as the freight rate "system" of the country, both railroad and shipping, is more like a crazy-quilt than a balanced structure. Freight rates are a vital element in the costs of both production and distribution, and not only businesses but whole sections of the country depend on such advantages for their prosperity. Naturally, they must fight —and the fighting must grow more intense—and there must be victories and defeats. But is a system based on such victories and defeats economically sound? And just what economic principles can be applied to a decision as to whether one part of the country is to benefit over another?

Labor, too, is becoming aware of the new competition. In many ways, labor was aware of the new competition long before management. The labor history of many industries is one long series of jurisdictional disputes arising from new competition developments. But now labor appears to be realizing that it must contribute in some way to its industry in the warfare of the new competition—that if the workers do not, then they may find that the jobs for which they have trained themselves for years — to which they have given their lives—may disappear altogether.

"Business is spotty!" How often in the past year or two have we noticed this phrase in the economic reviews? The leopard may change its spots, but they are still spots—and so with business. The spot may be a black condition in one industry one year and in another the next year—but there always seem to be spots. We have come to consider this with an economic fatalism which has become indifference. But must the prosperity of some industries be paid for by the misery of others? Must the textile worker, the miner and the farmer pay for the prosperity of the bricklayer, the automobile machinist and the printer? Or can we some day learn to achieve balanced prosperity?

We have already made tremendous progress in the new cooperation. From local and specialized trade associations we have developed conferences between different industries in the same field and between the various factors in each industry—and from these have developed institutes for the great industries, like food, or cooperative educational work, like "own-your-own home" campaigns. But there are still too many spite fences in American business. The time has come to destroy them—we must learn more of the relations between the industries and how they may be guided into cooperation and mutual understanding.

And how about the consumer? What benefits has the consumer gained from the new competition—and what dangers must be forestalled? The competition between alternative commodities tends to force those industries producing higher priced goods to use every means to lower costs. In distribution, also, the methods which are burdened with high costs are either forced out of business or else forced to greater efficiency and economy, as in the struggle between chain stores and independents. Thus the new competition benefits the consumer—but here, again, the new competition has its menaces. When the rayon industry first began, its product was sold as artificial silk, and frequently the word "artificial" was kept a secret. Before the product was properly developed, many inferior yarns were sold. As a result, the rayon industry, now producing a major textile in its own right, has in the last few years had to devote considerable effort and money to living down the reputation it made for itself in those early days. Did the consumer benefit from that new competition? When the fur industry a few seasons ago decided on mass selling by invading those markets which had hitherto been held by cloth coats, the competition inevitably became one of price between the two materials, and some fur garment producers had to sacrifice quality. Similar conditions for a time worked serious injury in the building materials industries, and many important and established materials suffered from the competition of inferior and improperly developed substitutes.

And how has capital benefited from the new competition? That question is more difficult to answer. Certainly, in the new competition, and its intensification of the old competition, is one of the major causes of what has come to be called "profitless prosperity." The new competition has necessitated increased plant and development expenditures, increased distribution costs in many cases in order to maintain volume—and has resulted in lower profit margins. The lower return on capital in the past year in many widely different industries may be a temporary phenomenon. Whether it is or not, we shall not understand until we understand how the new competition has not only tended to unbalance inter-industrial prosperity, but also to undermine the prosperity of individual businesses.

Whatever the business man, the worker and the consumer must do to achieve the benefits of the new competition and avoid the dangers, they must do only on economic principles. The problems of the new competition are not political or legislative. The courts and the legislatures are not the places for fighting the new competition. If we want the government to stay out of business, let us not rush to it for legislation to handicap our competitors. The Federal Trade Commission and the Interstate Commerce Commission exist to destroy unfair competition, not to create it. There are enough vital problems of business for the government to help solve without wasting its efforts and money on underhand methods of putting the other fellow out of business. The government has powers and resources and men who are contributing to American business the urgently needed records of fact, the technique of research and the machinery of guidance—and can contribute still more. Let us stop talking so much about government in business and business in government, and let us talk more about government and business.

It is time for business to emancipate itself from its own

(*Continued on page* 50)

A Magna Charta for Business

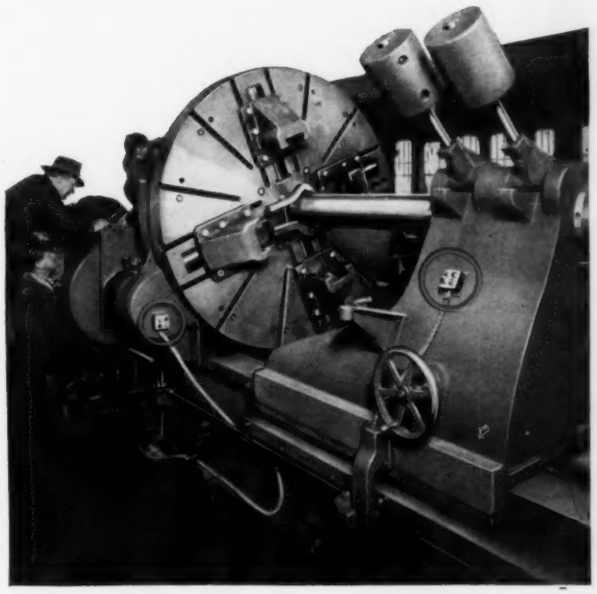
"Business problems cannot be solved by legal or political means unless they are based on sound economic principles and administered by those who understand those principles.

"Business must be free from the burden of unnecessary legislation and litigation and from harassing by officials with motives other than the public welfare.

"It is the duty of business so to conduct itself that its actions can at all times undergo public scrutiny with honor.

"It is the duty of business to clean its own house and it has the right to expect the utmost in cooperation from the public and the government."

AUTOMATIC Control *Speeds* Production



Time and effort are saved and spoilage of parts is reduced with the accuracy of operations possible with automatic devices

By G. H. WHITTINGHAM
Chairman of the Board of Directors, Monitor Controller Company

TODAY America pays the highest wages in the world and gets the highest productivity per man. In a way, this productivity is due to the high wages, because time has become so valuable that machines have had to be developed to use the time of expensive men to the best advantage.

By installing intricate and complete conveyor systems, some manufacturers have reduced the time of manufacturing from days to hours, reducing inventory and men at the same time. It is now coming to the point where minutes and seconds cut off production time mean the difference between plugging along and success.

The modern production manager is striving to reduce the time of manufacture because people are buying from hand to mouth, and he must follow with high speed production that keeps down inventory and enables him to respond to market requirements. Every production operation must be studied to determine whether a special purpose machine would not show a profit on investment. The manufacturer who leads in the use of special purpose machines wins out because he gets the benefit of his economies in profits. Later, competition causes him to reduce prices, and then his competitors are forced to the special purpose machine in order to stay in business. They do not get the real benefit. They are too late.

Automatic control is a part of any special purpose machine. In many cases of standardized production it is practically impossible to fit standard controllers to special purpose machines. The desired results can be obtained accurately with special control devices, and this accuracy pays for the cost of special control for unusual applications.

Briefly, the advantages of automatic control are:

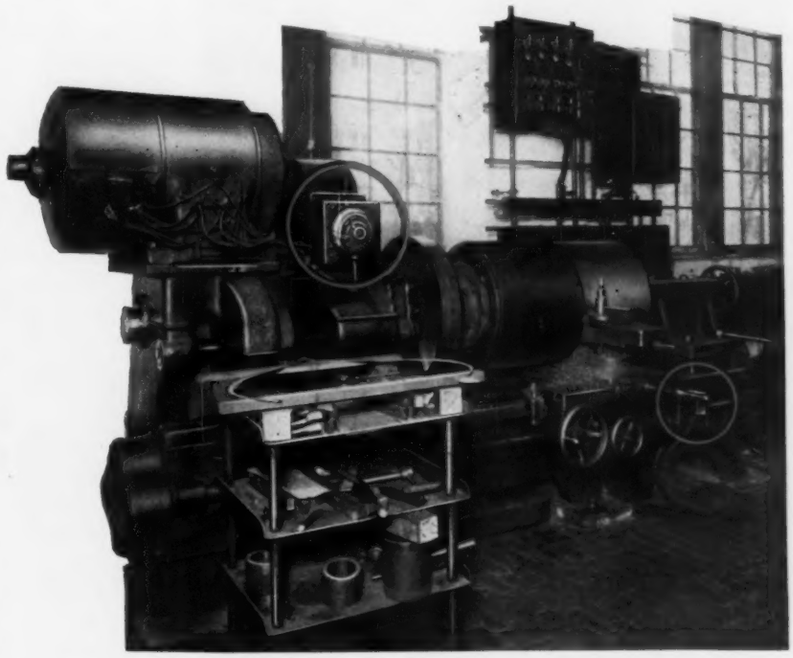
1—The motor is protected from incorrect manipulation.

2—The machine itself is protected from abuse, as far as power application is concerned.

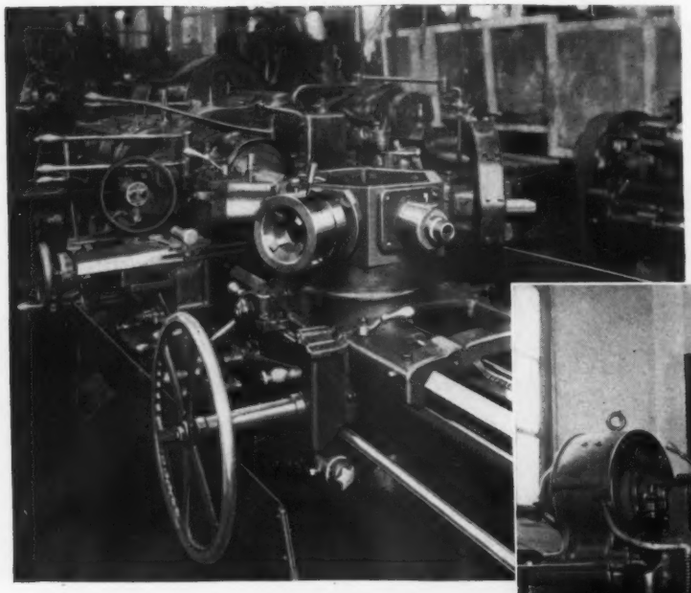
3—All operations are performed in accordance with a predetermined program.

4—It saves steps for the operator, bringing complete control of the motor to his finger tips, whether he is standing in one position, as on a drill press, or moving back and forth, as on a long lathe.

Automatic control includes a great variety of functions. Some of the simpler ones are starting, stopping, reversing and speed changing. All of these operations can be performed with unbelievable precision. Control can be actuated by pressure as in an air or water system, by travel as on a planer or an elevator, or at the will of the operator. Machines can be made to run a definite number of revolutions in one direction and then reverse. In fact, any com-



This special cylinder finishing lathe is equipped with a wide speed range commutating pole motor. The control station is on the tool carriage. The machine can be started, stopped and reversed without leaving the tool



The large turret lathe at the left has the control station mounted on the gear box within easy reach of the operator. The radial drill press below is equipped with a wide speed range commutating pole motor. The control station and the speed adjusting rheostat are located on the tool head. The controller, mounted on the wall, protects the motor from damage when the speed is suddenly increased or decreased. Accelerating relays on the controller perform these functions

bination of motor functions can be put through a definite program with automatic control, and with greater precision than is possible in any other way.

The work performed by the various machine tools varies widely in nature. No one type of controller can be said to be applicable to all types of machine tools, nor even to all types of machine tools of the same class. In every case the particular process or duty cycle of the machine must be considered; the sequence of production operation and the speed of each, the power required, grade of labor used and many other factors. Proper control in many cases is the most important factor in achieving the desired performance, either as reflected in time savings, in quality or in quantity of production.

The automatic control of electric motors divides into two distinct classes or groups which are as follows:

1—Starting and stopping.

2—Other special functions, such as speed changes, reversing, quick accurate stopping.

All motors, whether alternating or direct current, constant speed or otherwise, must be started and stopped as required. The controller for starting alone is a "starter".

The electric motor is a willing worker and, if required, will operate under conditions which are dangerous both to itself and to the machinery which it drives. Experience has shown that when motors are manually started the same reliability cannot be obtained as with automatic starting. The experienced operator is likely to start a motor too slowly, while the inexperienced operator is likely to start it too quickly. With automatic starting, nothing is left to the judgment of the operator. Everything is predetermined and always the same. There is no undue strain on either the motor or the machine—no blowing of fuses—no delays.

If the load on the machine is relatively light, the starter will bring the motor up to speed quickly. If the load is heavy, the contrary will be the case. If the safety of the motor automatically assures safety to the machine, one type of starter is supplied. If the safety of the machine is the paramount consideration and not intimately connected with the safety of the motor, another type of starter is supplied.

Each step in the starting process is performed automatically, with no hesitancy on any one step. As a result, there is no arcing at contacts, such a frequently occurs where motors are manually started.

Motors should be chosen to suit the requirements of the machine and the work it has to do. Some machines start light and run for long periods at constant speed. Some start heavy flywheel loads. Some run heavily loaded in one direction and lightly loaded in the opposite direction. Some must have their speed adjustable over a wide range. Some must have accurate control at very low speed and a definite high operating speed. Requirements could be listed without limit, due to the variety of conditions.

Electric light and power companies usually supply alternating current because of its peculiar suitability to economic distribution over wide areas. Many plants that generate their own electricity use alternating current for the same reason. However, in places where speed must be varied over a wide range and a nicety of control is essential, there is nothing to compare with the direct-current motors of suitable design. The usual alternating-current motor is constant speed. There are types, however, which have more than one running speed.

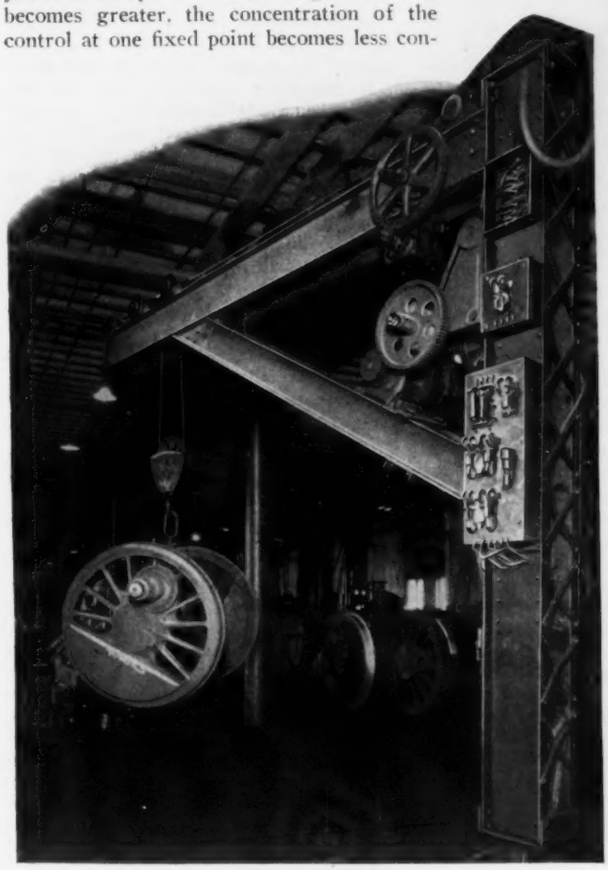
Some alternating-current motors have speed adjustable over a definite range, some have splendid starting characteristics. Therefore the subject of choosing motors for machine tool drive is of extreme importance and one which has received far too little serious consideration. Many machines are not giving the service they should just because they are driven by the wrong kind of motor.

A motor may be built in full accord with the standard specifications of the Power Club, or the A. I. E. E., and yet be entirely unsuited to the service to which it is used. A great good will have been accomplished if those who buy motors for machine-tool applications will consult with the

engineering departments of motor builders and not buy motors by the horsepower at a price. The only price that should be considered is measured in terms of service rendered per dollar of investment and cost of operation.

The requirements of different kinds of lathes, such as engine lathes, turret lathes, axle lathes, etc., vary considerably with the different work the machines are required to perform. Therefore the motor and control equipment must be selected or designed for the specific duties and type of work the lathe is to perform. The cutting speed of lathes depends upon a number of factors, among which are the kind of metal to be worked, the diameter of the work and whether a rough or finishing cut is being taken. With the exception of automatic lathes always taking the same size stock and turning it to the same dimensions, it is necessary that the rotating speed of the shaft of the lathe be varied inversely with the diameter of the work in order to obtain the most economical cutting speed. This economical cutting speed also depends on the material.

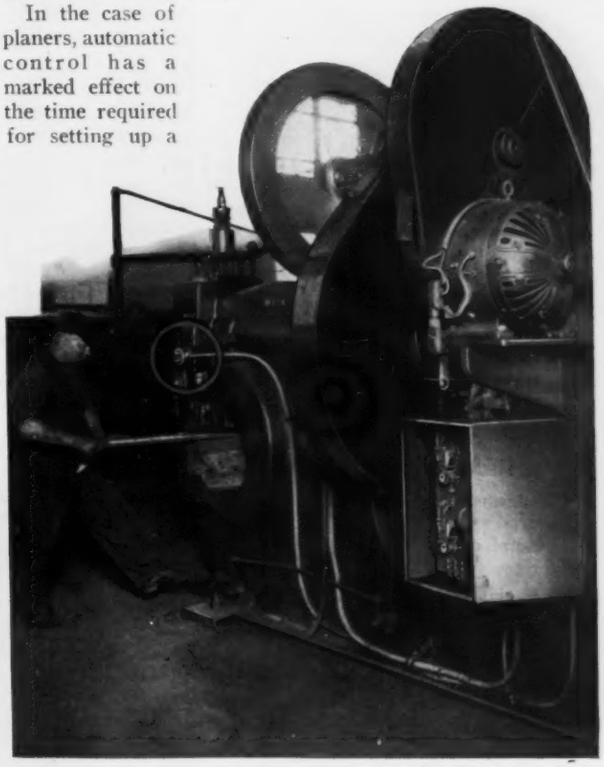
Therefore the lathe which gives the most graduated increase in speed will permit the most efficient cutting speed for all diameters. For this reason a lathe equipped with a direct current adjustable speed motor and a proper automatic controller will give on the average a higher output than a lathe equipped with a constant speed motor and a gear box. Even where gear boxes are provided, automatic control has been found desirable to effect closer adjustments of speed. On small lathes, such as are used in the average tool room, the master station, generally of the push-button type, and field rheostat can be mounted at the head of the lathe where they are readily reached by the operator. On these types of lathes automatic control usually provides for automatic starting, stopping and reversing and manual adjustment of speed. As the length of lathes becomes greater, the concentration of the control at one fixed point becomes less convenient for the operator. This is one of the great objections to the use of gear boxes, as they must be located at the head of the lathe and consequently some distance from the operator. With automatic control the necessity of the operator going to the head of the lathe to effect speed adjustments is eliminated.



The control devices for the direct current motor driving this boom crane are mounted on the column. A lever type station on the column permits the motor to raise or lower the load

On radial drills the control may be placed at the position which the operator naturally occupies in order to keep a close watch upon his work. From this position he can readily start and stop the machine and change its speed to correspond to the material being drilled and the tool being used. No time is lost in shifting belts or in walking over to a controller. Automatic control gives the operator as complete control over the driving motor as if the controller itself were in his hands.

In the case of planers, automatic control has a marked effect on the time required for setting up a piece of work and for the planing operation itself. Efficient production necessitates adjustment of the cutting speed with the metal being worked and the depth of the cut. The time required for the return stroke of the planer is, as far as profits are concerned, non-productive. It is therefore essential that at the end of each cutting stroke the bed be stopped and reversed in the shortest possible time and again brought quickly up to speed for the next cutting stroke.



A single motor mounted in the frame, as shown, drives this punch and shearing machine. The start and stop push buttons are mounted near each operator to facilitate control of the machine

Automatic planer control may be divided into two general types. In one, mechanical means are used to reverse the planer bed. In the other, the reversal is accomplished by changing the direction of rotation of the motor. Of the two systems, that which depends upon the changing of the direction of rotation of the motor is by far the more efficient. The starting, reversing and the restarting conditions at the two limits of travel of the planer bed represent two separate and distinct problems in motor control.

The normal reversal of the planer table is accomplished by means of switches attached to the table. These can be adjusted to give any desired table travel. In addition, push-button or other master stations are provided.

The VALUE of *Research*

Industrial research is making great strides in this country. According to the last census, there are upwards of 1000 industrial research laboratories

By Charles E. Skinner *

Assistant Director of Engineering
Westinghouse Electric & Manufacturing Company

NO phase of modern industry holds more fascination for layman and manufacturer alike than does that of research. To the layman, the research worker appears as a hardy pioneer who spends his life adventuring in unknown lands in quest of golden discoveries. To the manufacturer, the research worker appears as one of his most valuable tools, a tool capable of aiding in the performance of such extremely important tasks as the cutting of costs, the development of new materials and methods and the refinement of materials and methods now in use.

Industrial Research

THE terms "industrial research" and "industrial research laboratory" have come into general use only within the comparatively recent past. We formerly had laboratories and experimental departments, and research, as the term was understood, was mainly confined to a relatively few university and government operated laboratories. Prior to the Great War we had organized in the United States quite a number of industrial research laboratories, some of them already operating in a very large way. The war and related developments have given a very considerable impetus to the establishment of research laboratories in many and varied lines of industry so that the growth of industrial research has been very rapid since the war.

The enormous strides which have been made in those industries which have inaugurated and carried out definite and systematic research programs, has no doubt had much to do with the present-day sympathetic attitude of almost every industry in the country to the question. This has resulted in a very rapid increase in the number of research laboratories and research workers in nearly every branch of industry. The larger manufacturers are in the main carrying on programs of research within their own organizations, while many smaller manufacturers have a nucleus of research workers or have combined in cooperative research programs.

As a rule, the principal function of the industrial research laboratory is to develop new and useful products and processes for the industry it serves. In some cases, its main function may be, in cooperation with customers, to develop new uses for products already established. It may be established for the main purpose of improving manufacturing processes, or aiding the development of new devices and applications based on some outstanding invention which provides the main product of the manufacturers served. Most industrial research laboratories find that an inevitable part of their work consists in curing and anticipating troubles either with the product, the processes involved, or in the applications of the product.

We are, in this article, mainly concerned with the value of an organized commercial research laboratory operated in connection with and for the benefit of a manufacturing business. Notable individual contributions will undoubtedly be made in the future as in the past, but for their development and use, the modern industrial research laboratory will play a major part. Such laboratories are also contributing fundamental inventions, and the major output of such inventions may be expected from the one thousand or more such laboratories in the future. The well-equipped and well-manned laboratory is also in a far better position to develop commercially such inventions than an individual, both on account of equipment and on account of the ability of such laboratories to bring the work of many experts from the laboratory, the engineering department and from the shop to bear on such developments.

The invention of the modern gas-filled incandescent lamp resulted after a long and painstaking investigation and research into vacuum technique, the effect of gases on some little known phenomena in connection with lamps and other devices employing vacuum carried on by an individual worker, Dr. Langmuir, of the General Electric Company's research laboratory. The development of the gas-filled lamp to a point where it has eliminated the once popular arc lamp and superseded most other types of illuminating devices, has resulted from the contributions of many research workers following the original invention. Through this and related inventions the quality of illumination has been bettered through the years and its cost continually reduced.

The major requirements for materials in the electrical manufacturing business may be divided into four general classes: Magnetic materials, insulating materials, conducting materials and construction materials. The quality of magnetic materials has formed the subject of continuous research, practically since the inception of the manufacturing business. The cores of transformers and other alternating current devices are subject to losses due to the rapid reversals of the magnetic flux. These losses serve no useful purpose, so far as the device is concerned, but require an expenditure of energy which constitutes a not inconsiderable part of the energy developed by the prime mover and which it is desirable to eliminate so far as possible. This loss is kept to a minimum by the careful manufacture and selection of the material used, and by careful heat treatment of the material before its final use.

It was early discovered that the materials then available were subject to a very great increase in this core loss in service, and it was soon proved that this increase in loss was due to some change in the characteristics of the iron or steel brought about by temperatures on the order of that of boiling water. The problem of non-aging material was finally solved by the invention of silicon steel by Sir Robert Hadfield of England. This steel, containing silicon as high as 5 per cent, not only stopped aging, but also resulted in great reductions in initial losses, so that the present-day core losses may not be more than one-quarter to one-third of those found prior to the development of silicon steel.

Synthetic Resins

THE introduction of synthetic resins, such as bakelite, has revolutionized the processes of manufacture of many of the materials and products where such materials are applicable. This is especially true in the electrical field, where much research has been necessary to establish satisfactorily the processes for the use of these resins as substitutes for the natural resins formerly used. These natural resins act very differently under treatment from the new synthetic resins. Shellac, for example, can be melted and remelted many times, but the most of these new synthetic resins become both insoluble and infusible with comparatively short time heating to the original melting point.

The modern research laboratories, both in the pure research field and in the industrial research field, have given us many

* *From an address delivered April 20, 1928, at National Convention of American Gear Manufacturers' Association, Rochester, N. Y.*

to MANUFACTURERS

instruments and tools unknown a few years ago and which have contributed a major part to our present-day developments. As a specific example of an instrument which has taken various forms and which has been based on different fundamental principles has been developed which makes possible the analysis of electrical waves of various kinds. This instrument is called the Oscillograph. By its use electric waves of voltage and current may be made visible or may be photographed. This instrument has undergone marvelous development in the hands of our Mr. J. W. Legg during the last ten years, and its application has been extended into many fields. It provides an instrument for the study of mechanical vibration, and through its use inaccuracies in high-speed gears may be located.

By its use deaf and speechless persons are now being taught to talk. This is accomplished by making the voice wave of the teacher and the pupil visible side by side. A sound is made by the teacher, and the pupil experiments until he produces the identical wave form. This method makes it possible to accomplish in months results which took years by the ordinary accepted methods. Pianos can be tuned by sight, lightning disturbances on electrical transmission lines can be measured with a relatively high degree of accuracy.

One of the outstanding developments in modern industry during the recent years is that in the radio field. This industry is founded on fundamental research and utilizes a number of inventions and discoveries made in the laboratories devoted to pure research. Perhaps no other industry of today occupies the attention of so many research workers, and it is doubtful if equal progress has ever been made in any other line in the number and variety of inventions and applications. The money values involved in the radio business from its small beginnings of a few years ago to the present time is one of the wonders of the modern manufacturing business.

Improving Processes

A LARGE part of the industrial research laboratory work may be involved in improving or controlling the manufacturing processes involved. In fact, the more highly specialized a manufacturing process or product becomes, the more necessity there is for accurate and scientific control of the materials and processes. The process for the manufacturing of treated filaments for radio tubes was developed in the research laboratory. This process and the control of the materials involved are so exacting in their requirements that constant attention and supervision of the research group is necessary in connection with all of the commercial filament made.

Reference has been made to the inevitable "trouble shooting" by the research laboratory and research for the anticipating of troubles. "Trouble shooting" in itself can hardly be denominated as research, but intimate contact with troubles which occur with materials or processes or products, become a very valuable asset to the research laboratory. This kind of work not infrequently leads to new developments of primary value to the industry served, in addition to the distinct aid given in solving difficulties which arise from time to time.

C. E. Skinner

A very important application of helical springs of an unusual size resulted in an epidemic of trouble. The application was such that a change in the design of the apparatus as a whole to remedy trouble would have been extremely expensive. Consequently, it was necessary to solve the trouble by producing springs which would stand the service. A research into the cause of trouble led the investigators into every phase of the question. Discovery was finally made of the fact that the material of the spring wire was much softer on the inside of the coil than on the outside of the finished springs. This led to a modification of the quenching and drawing process which made it possible to secure uniform temper throughout the cross section of the spring material.

Standardization and research may seem to be opposing terms. As a matter of fact, however, many of the standardization projects undertaken within a given manufacturing company or by the industry at large, involves a considerable amount of research in order to establish the conditions under which the standardization may be satisfactorily attained. One of the fundamental bases for the standardization of electrical apparatus involves the question of the limiting temperature at which such machinery may be operated. The early work of the Standards Committee of the American Institute of Electrical Engineers to establish these temperature standards required a very large amount of research work on the effect of both sustained and short-time peak temperatures on the insulating materials used in the construction of electrical machinery. Any dimensional standardization, to be satisfactory, requires that the minimum number of sizes and varieties suitable for a given service be selected. This in itself frequently necessitates a certain amount of research in order to arrive at the minimum satisfactory list.

Researches may be undertaken for the simple purpose of eliminating waste. In the electrical business, as in some others, large amounts of varnishes are used which contain alcohol, benzine or similar solvents. The solvent serves merely as a vehicle for the application of the solid matter in the varnish and is driven off either by natural evaporation or heat after the varnish is applied. A careful set of researches has developed solvent recovery plants in our works, which return for re-use a considerable portion of the solvents originally employed in some of our continuous varnishing processes, and which not only were completely wasted in the older processes, but which also served to contaminate the surrounding atmosphere. Researches may be undertaken for the sole purpose of abating nuisances, such as the contamination of streams by waste liquors from manufacturing plants, and in not a few cases the result has been the recovery of values more than compensating for the cost of abating the nuisances.

Successful Results

I HAVE endeavored to indicate that no manufacturer can expect to keep abreast of the present-day progress of industry, except by the utilization of the results of research either carried on by himself or by others. In fact, successful results obtained in industrial research, while of primary value to the group controlling it, are of ultimate value to all industry.

In conclusion, research intelligently directed and applied, is of value to the present-day manufacturer; in fact, it is essential to his very existence. This is true, whether it be undertaken for any one or for all the reasons which have been mentioned in what has preceded and which may be summarized as,

Research:

To cure trouble;

To anticipate and prevent trouble;

To improve the quality of materials or products;

To develop new processes, materials or products;

To develop new uses for existing products;

To effect savings;

To abate nuisances;

To develop new products to meet an existing market or to create new markets;

To assist in standardization;

To aid in perfecting new materials or devices;

To develop better customer and public relations;

and last, but not least, research undertaken to add to the sum total of human knowledge which not infrequently results in material and cultural advances of the most profound import to all mankind.

MARKETING SYSTEMS *for*

No. 3 of a Series of Three

The manufacturer needs competent sales manager—a man whose sympathies are largely on the marketing side of business. An experienced sales manager knows that no matter how good a product is, that it must be sold and kept on being sold or the public will pay no attention to it. If a sales manager accomplishes nothing else, he will earn his grub if he keeps the manufacturer from under-estimating the size of his selling task.

ing distributing machinery so far must be flexible, and it must involve a

BY JOHN
Marketing

WHAT is the ideal marketing plan for an electrical manufacturer? "There is none," is the easiest and safest way to answer that question. It is possible for a manufacturer to set up, theoretically, an ideal selling system. In actual practice, however, any plan, no matter how well it may be conceived, is likely to fall far short of perfection.

Instead of looking for an ideal system, the manufacturer should compromise on a workable system. A selling scheme that will dispose of goods at a profit, regardless of how imperfect or perfect it may be, is what is wanted.

A queer thing about these workable selling plans is that it is impossible to acquire one of them ready-made. The manufacturer has to build them to his own order. I suppose the number of sales plans that I have examined in the last twenty years would run up into the thousands, but I do not recall that any two of these plans were exactly alike. They all had their individual differences caused by the peculiarities of the businesses in which they were used.

Fundamentals of Marketing

BUT although a manufacturer has to build his selling plan according to his needs, still it is possible for him to draw on the experiences of others in building it. There are principles that can be used in almost every business. Certain fundamentals have been discovered, about selling goods in all lines, which the electrical manufacturer can apply to the marketing of his product, regardless of whether he is making producers' goods or consumer goods. While it may not be feasible to organize an ideal selling system that can be fitted into any business, it is feasible to outline principles and to formulate fundamentals that can be adapted to almost any business.

There are four main fundamentals of this kind:

1. A business should have competent sales direction.
2. In so far as possible a business should use existing distributing machinery.
3. The selling plan should be flexible.
4. The marketing plan should provide both persistent and consistent sales effort.

Competent Sales Direction: An electrical manufacturer requires a competent sales director, no matter how small the business may be. Many manufacturers make the mistake, in their earlier days, of trying to take charge of their own selling activities. This plan is seldom satisfactory. Not one manufacturer in ten is capable of building a sales organization. The average manufacturer is mechanically minded. His interests are altogether on the production side of his business.

IT is possible for a manufacturer to set up, theoretically, an ideal selling system. In actual practice, however, any plan, no matter how well it may have been conceived, is likely to fall far short of perfection. Instead of seeking an ideal plan, the manufacturer should compromise on a workable system

Manufacturers who have an engineering bias are likely to take the attitude that goods that are well made will sell themselves. This attitude is altogether too prevalent in the electrical industry. Inventors are so proud of their contrivances that they harbor the notion that the public will be unable to get along without them. Such an attitude seriously handicaps a young business. If indulged in too long it may well prove fatal.

A manufacturer can avoid this danger by appointing a

Many manufacturers feel that there is no need of hiring a sales manager until the business is well established and a number of salesmen are on the payroll. They contend that the job of a sales manager is to direct salesmen and that until the company is large enough to justify a selling corps, a sales manager would be a useless appendage.

Function of a Sales Manager

BUT that is where the manufacturer is in error. He needs a sales manager, even though he has no salesman. The function of a sales manager is to market a factory's output. He may accomplish this task without any salesman at all. He may sell his output by mail, or through advertising, or he may choose to sell it outright to a few large distributors. The fact that he elects not to use salesmen in marketing his goods in no way reflects on his ability as a sales executive.

Of course, the average marketing executive does find it advantageous to use salesmen. But the point is, not that he uses them or does not use them, but that he should be in on the ground floor, when the business is starting, to decide what selling policies the young concern should pursue. The time to formulate sales methods is before the business has acquired a lot of bad practices and established a number of unfortunate precedents.

There are many questions that the new manufacturer will be called on to answer. Shall he sell through wholesalers or shall he accept some business direct? Shall he send missionary salesmen to help his distributors? Where should he use his own salesmen and where should he delegate territory to manufacturers' agents? How many products can a salesman sell? Scores of problems of this kind will be constantly arising. Unless the manufacturer solves them correctly, early in his career, they will keep nagging him until he does solve them. The only way he can solve them is to place an experienced sales executive in charge of his marketing.

Where shall he find such a man? In too many cases manufacturers get sales managers by promoting their star

Distributing ELECTRICAL Goods

Articles on Distribution

sales direction; he should use existas possible; his marketing plan sales effort persistent and consistent

ALLEN MURPHY
Counsellor

salesman. In the vast majority of cases these manufacturers thus lose a good salesman and acquire a poor executive. Not one star salesman in fifty is qualified to become an executive. The good salesman is temperamentally unsuited for a sales manager's job.

The trouble with cracker-jack salesmen is that they are not able to forget that they are salesmen. When they becomes executives, instead of showing their men how to sell, they find it easier to jump in and get the order themselves. If there is a big order at stake they are afraid to trust it to a regular salesman, so they grab it before a competitor has had a chance to get his fingers on it. Naturally this demoralizes the sales force and eventually leads to a condition where the manager is, himself, doing most of the big-time selling.

A Sales Manager as an Organizer

A GOOD sales director must have these qualifications: he must be an organizer; he must be a teacher; he must have the ability to influence others. If, in addition, he is able to sell, very well and good, but selling ability, while desirable, is only a secondary qualification.

Being able to teach, to demonstrate points of advantage, to show others how to do things, to enthuse others and to convince them that they ought to do so-and-so, are qualities that a sales manager should possess. A teacher need not be a do-er. He must be able, though, to get others to do. This explains why many of the most successful sales managers in the United States were failures as salesmen. But they succeeded as supervisors, as crew managers, as demonstrators or as field executives. In this way they proved their fitness for the sales manager's desk.

Once a competent sales director has been installed he should be given full authority. There is nothing quite so pathetic as a sales manager whose hands are tied. His lack of power is soon communicated to his salesmen and to his distributing agencies. As a result they lose respect for him. Thus the whole business is handicapped.

A QUEER thing about these workable marketing plans is that it is impossible to acquire one of them ready-made. The manufacturer has to build his plan to his own order. But it is possible for him to draw on the experiences of others in building his marketing plan in a manner that will meet his needs

The sales manager should be equal in authority with the head of the company's production department and also the head of its financial department. In fact, it is becoming the custom to make vice-presidents of each of these three important executives, and as such they work under the correlation of the company's president.

As the business grows, it will become necessary to have more than one sales manager. However, an organization should always have one supreme sales head, no matter to what size it attains. All other sales executives should function under the direction of the czar or they may work with him as a committee, with him as chairman. Many large companies, such as the General Electric Company and the National Lead Company, use the committee plan.

Experience has demonstrated the advisability of increasing the number of sales managers as the number of salesmen grows to a point where it is impossible for one executive to give them direct attention. In this case, the usual plan is to appoint district sales managers. The original sales manager may handle a district in addition to serving as general sales manager.

Division of Sales Management

IT is also well to appoint separate sales managers for each line of goods that enters unconnected markets. For instance, if a concern serves both the industrial and consumer markets, a different sales manager ought to head each division. Most companies follow this practice. An illustration is the Radio Corporation of America. It has a general sales manager, in charge of all marketing. It also has a sales manager at the head of its engineering products division and another sales manager directing the Radiola division. That is an ideal set-up and should be followed by all manufacturers having diversified lines.

There is one other aspect of this question of sales direction that must be touched on in this article and that is the matter of compensation for the sales executive. Most sales directors in the electrical industry, as well as in other businesses, are paid only a straight salary. In many cases, they also own a block of the company's stock. Seldom, however, do they own enough stock to make it worth while.

The salary system of compensation comes a long way from being ideal. A salary, no matter how large it is, is not a sufficient incentive to make the average man do his best. The salaried man always remains an employee. To bring out his real capacity, it is necessary to place him in business for himself. This can be done by giving him a commission, in addition to a salary.

A commission, as far as the electrical industry is concerned, is better than a bonus. Many concerns give their sales executives large bonuses for attaining certain quotas, measured either in dollars or in units of the product. This plan is all right, if it is wisely projected. Usually, however, a bonus system of this type causes the sales department to adopt desperate measures to reach it. In reaching it they often pursue such unsound methods that the business is demoralized. And if they do not attain this quota, they do not receive extra compensation for all their hard work. This discourages the department and slows it up the following year.

Where a commission is paid on top of a salary, however, the executives get something extra for every sale they make. This is sufficient inducement to keep them working, and at the same time does not encourage over-selling. In

many cases a small bonus can be paid for quota attainment, in addition to the salary and commission. It should be so small that is will not induce extravagant selling.

Using Existing Distributing Machinery: In the previous articles in this series I described the principal distributing units that exist in the electrical trade. The industry is particularly fortunate in this respect. It is blessed with more different types of distributors than are most businesses. In so far as he can the manufacturer should use these established distributors. There is no need of him setting up distributing machinery of his own if he can find existing machinery that is qualified to do the job for him.

There are three main reasons why it is best for a manufacturer to look for established selling machinery before creating his own:

1. In that way he can keep the number of his own salesmen down to the minimum.

2. It will enable him to sell his market as experience has demonstrated it wants to be sold.

3. It will place his goods within the convenient reach of the greatest number of possible buyers.

It is important that any marketing plan that an electrical manufacturer may adopt provides for only as many salesmen as are absolutely necessary. Whether a market be measured by total population, by retail outlets, by income tax returns, by smokestacks or whatnot, it will call for more salesmen to reach it than the average manufacturer can afford.

Many concerns that cater to the industrial market figure that there is a prospect wherever there is a smokestack. There are close to a half million smokestacks in this country, not counting the plants that have more than one stack. Even this figure does not include the numerous concerns that buy their power from central stations and, hence, have no smokestacks.

If a salesman made ten calls a day it would take him 50,000 days to visit all these plants. It would take 165 salesman an entire year to call on all these plants once. Not many manufacturers would be financially able to hire any such number of salesmen to test the possibilities of their market.

A much easier and quicker way to cover these 500,000 plants would be through existing selling agencies—wholesalers, special distributors, manufacturers' agents, etc. These agencies maintain regular contact with buyers in their territories and are in better position to prime the market for a product economically than its manufacturer can.

Of course the manufacturer will need some salesmen, but he won't require nearly as many as if he tried to do all his selling. He will need a few salesmen to call on wholesalers and distributors. Some men will be required to do missionary work, to visit the more important markets and to interview the large buyers, who cannot be sold through intermediaries. Operating in this way, he will not need one-tenth as many men as if he attempted to have his own organization cover the entire market.

The same reasoning would apply to a concern that wished to sell the retail trade or the consumer. The most economical method to sell the retailer and the consumer is to get established distributing machinery to supplement the manufacturer's own organization.

The second reason for using existing distributing facilities is that in that way a manufacturer is able to sell a prospect in the manner that he is accustomed to buy. Every industry has certain methods of buying that have been in vogue for years. If an electrical manufacturer wants business from the moving picture industry, the coal mines, hotels or any ither industry, it is folly for him to run counter to the buying customs of that industry.

That explains why some of the oil burner manufacturers made a mess of their selling, when they first started. They sold through distributors who knew nothing about the heating business. There is a lot more to a heating installation than the furnace. For instance, the best heater in the world won't heat a building if there is insufficient radiation.

The third reason for using the selling channels that are already functioning in the trade is in that way the manufacturer can get a wider distribution for his product. Neither the industrial buyer, the retailer nor the consumer will go very far for their goods now-a-days. Merchandise must be quickly available in the neighborhood or the buyer will purchase something else. The size of jobbing zones are constantly being reduced. The reason is that wholesale stocks have to be placed closer to the market. Without the assistance of wholesalers or distributors, the manufacturer cannot keep his wares as accessible as buyers demand.

AN electrical manufacturer needs a competent sales director, no matter how small the business of that manufacturer may be.

He needs no new distributing machinery if he can find existing distribution qualified to do his selling job.

He needs a flexible marketing plan, because lack of flexibility has caused the ruin of many selling systems.

He needs to be consistent in adopting policies and sticking to them, and he needs to be persistent in keeping everlastingly at the business of selling his lines

The Selling Plan Should Be Flexible: Lack of flexibility has ruined many a sales plan. One manufacturer in the electrical industry lost several million dollars a few years ago in trying to market his line through an inflexible marketing scheme. He had more than a thousand salesmen, working the consumer for the benefit of his dealers. These men were given a drawing account. The vast majority of the men hired did not make good, but it took several weeks to discover that they were unable to sell the line. In the meantime the manufacturer was out $400 or $500 on each of these failures. Before the company woke up to what was happening, it was in the hands of bankers.

The drawing account was the inflexible feature in that sales plan. It is impossible for a manufacturer with an uncertain market to hire an army of salesmen and to extend a guarantee to each man. A manufacturer who has been in business for years and who is able to forecast his sales for a year ahead, might be able to assure his salesmen a certain income. But the market for the average electrical appliance fluctuates too widely to make this a safe plan of operation for most appliance manufacturers.

It is good policy, as I have said before, for a company to pay its sales executives both a salary and a commission. That is also the best way to pay salesmen who are calling on industrial buyers and on the distributing trade. But it is not a practical way to pay consumer salesmen, for the reason that if a manufacturer goes in for house-to-house selling, he will have to have hundreds of salesmen, if not thousands. The only feasible way of paying these men is by commission, after the sale is made.

Another reason for flexibility is that it should be possible to expand and contract the field force as business conditions warrant. A bumper crop in the West might make it advisable for a manufacturer to increase his sales effort in that region. But he must do it quickly to catch the benefit of the boom. On the other hand bad business conditions in other parts of the country might make it necessary for him to curtail his sales force there.

(*Continued on page* 47)

Business Men Are *Taking Up Slack* in Industry and Commerce

Mergers and cooperative movements in industry and business mark the first six months of 1928

By F. M. Feiker
Managing Director, The Associated Business Papers

F. M. Feiker

MERGERS and consolidations, apparent discounting of the old prejudice of poor business in a Presidential year, unexpected gains in some lines, sharp retrenchments in others, normal business in general on the 1927 level and cooperative group attacks upon common business problems, mark the first six months of business for the year 1928. Business men in key industries, trades and technical professions, reporting through the editors of their respective business publications for the first semi-annual survey of business conditions undertaken by the National Conference of Business Papers Editors and the Associated Business Papers give these as the outstanding trends of business for the first half of the current year.

The steel industry by high specialization in developing many small volume markets has completely taken up the slack of a greatly reduced volume of steel orders by railroad. The meat packing industry has enjoyed a larger volume of business and a strong domestic market. The automobile industry, save Ford, is going ahead of expectations and should finish the year about on a par with or better than 1927, with manufacturers much nearer the solution of the used car problem.

Editors in all lines report no important decreases in wages, some slight rises in specialized industries and individual shortages of highly skilled mechanics. Total payrolls, on the other hand, are considered a little below those of the first six months of 1927, due to more automatic machines.

Another interesting side light is the expansions that have been made in service industries, notably the hospitals and the restaurants. These industries have greatly increased their total number of employees. There has been a distinct flow of labor from producing industries into service work, providing employment for those who otherwise would be unemployed. This trend is general, but as yet no statistics are available.

The editors are unanimous in reporting that the first six months of 1928 have been characterized by many desirable major and minor mergers, cooperative market finding activities and intelligent control of production.

The building and construction industries are outstandingly booming. In dollar volume these industries are far ahead of 1927, which was the largest year on record. Building and engineering construction for the first five months of the current year is nearly 25 per cent ahead of that same period for last year, and operations are being carried on in practically all sections of the country. The largest gain as to class of work is in commercial building, and as to geopraphical region, the Middle Atlantic States. Home building, however, is below last year.

Construction costs, instead of skyrocketing, are holding remarkably constant, and wholesale and retail stocks of building supplies are reported to be 30 per cent below what they were a year ago. The outlook for the building industry is that gradually it will return to a new normal annual volume, almost twice as great in dollars as the average year of the pre-war level.

The electrical industry reports that the total production of electricity was about nine per cent greater for the first half of the present year than for the similar period of 1927. The railroads are credited with being efficiently operated and giving dependability and speed of service in freight shipments that surpasses all previous records, despite the fact that the volume of freight is somewhat less than that of 1926 or 1927.

The rubber industry, on the other hand, is reported to have suffered very greatly since the first of the year. The complete abandonment of the British rubber restriction policy caused the collapse of the crude rubber market, prices tumbling from 44 cents per pound to 17 cents, the lowest in years. American manufacturers were caught with excessive inventories of goods made of high-priced rubber, and with commitments for over 100,000 tons of high-priced crude rubber. Retail tire price reductions forced these manufacturers to write off a large depreciation on finished tires and tubes. This meant an actual physical cash loss of fully $75,000,000.00.

The rubber industry is credited with starting to recover, although practically every manufacturer will show a substantial loss for the year. The organization of the American Rubber Institute under General Lincoln C. Andrews, former Federal Prohibition Director, will stabilize the industry and correct bad merchandising practices.

The textile industry is not as seriously depressed as rubber is considered to be during a period of "profitless prosperity." Business for the first half of this year ranged from normal to depressed. Most divisions of the cotton and wool branches conditions are now decidedly sub-normal, because of machine-hour productive capacity considerably above normal consumption and failure by manufacturers to balance production and consumption. In this industry, how-

(*Continued on page* 50)

SHAPING METALS Into Electrical Parts

Dimensional accuracy of parts made of the right material largely determines the success or failure of the assembled electrical product

By H. W. CRANFORD

COUNTLESS numbers and varieties of small metal parts enter into the finished products of the electrical industry. Upon the choice of the right material for these parts and the accuracy of their dimensions depends the success or failure of the assembled appliance. The factor of cost of each part, diminutive as it may be by itself, influences the aggregate cost of the product, and therefore, wide play is frequently given to engineering and manufacturing ingenuity in selecting materials and working processes that will do justice to the quality demands made upon the product by the consumer and at the same time lessen sales resistance by reason of the attractive price at which it can be marketed.

Hardly a day passes when no new alloy or heat treatment method comes forth from the world's metallurgical laboratories. Progress in mechanical systems for shaping parts has also been speeded up considerably of late. Mass production of electrical refrigerators and clothes washers has brought into being a special class of foundries which turn out the thousands of light castings required in small motors for end bells, by a continuous process that yields 1200-lb. castings an hour, the molding sand being used over and over again through an automatic reconditioning system.

Such foundries have very little in common with their namesakes of yesteryear. They are, in fact, parts-manufacturing plants with scientific control methods that contrast sharply with the hit-or-miss practices of the old-time gray iron foundry. And so it is throughout the entire broad field of metal shaping, many consumers being unaware of the progress made because names of old processes stick to production methods that differ radically from their forerunners.

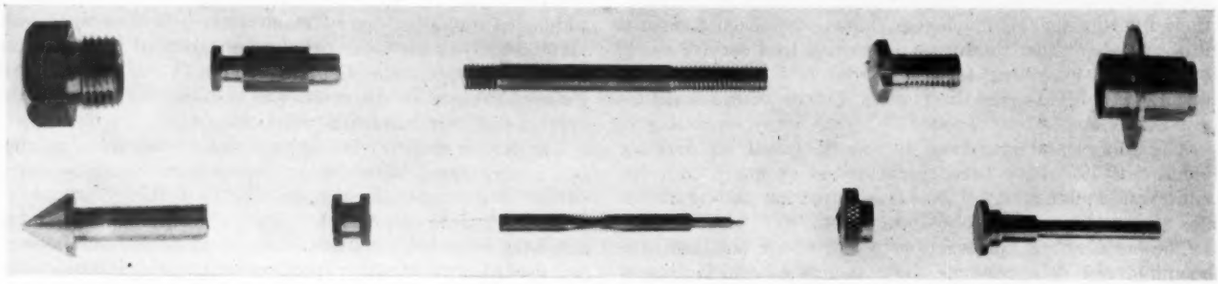
Of paramount importance in the economical production of the myriad of small electrical parts is the so-called automatic screw machine. This is so versatile a combination of machine tools that it fashions an endless variety of shapes, having very little in common with ordinary screws and nuts for the manufacture of which the first of these machines was brought out some forty years ago. It is difficult to say whether mass production of electrical appliances, very few of which do not contain screw machine products, was made possible by the automatic screw machine, permitting millions of parts to be shaped with the accuracy of their dimensions maintained to the five-hundredth part of an inch; or whether it was the other way around, and the demand from the electrical industry, which from the outset sensed the automatic screw machine to be one of the most important of its mechanical adjuncts, spurred the builders of the machines on to add one attachment after another, thus constantly broadening their field of usefulness.

Relatively Simple Operations

STEEL as well as non-ferrous metals and their alloys, such as brass, bronze, nickel-silver, etc., lend themselves to shaping in the automatic screw machine. Bar stock is best suited.

A large volume of electrical parts calls for relatively simple operations, performed by the turret and cross-slide tools, such as turning, knurling, drilling, reaming, threading or tapping, and forming and cutting-off.

Attachments which make possible auxiliary operations before the part is dropped from the machine, are either standard or special. The standard attachments serve for slotting, burring, and index drilling after the piece has been parted from the bar. These attachments are applied to the front of the machine, and as the pieces part from the bar an



Many and various types and sizes of metal parts are used by electrical manufacturers. The illustration above shows several as turned out by the automatic screw machine. Engineering and manufacturing ingenuity has a wide play in selecting materials and working processes which will insure a product of the highest quality at an attractive price to the consumer

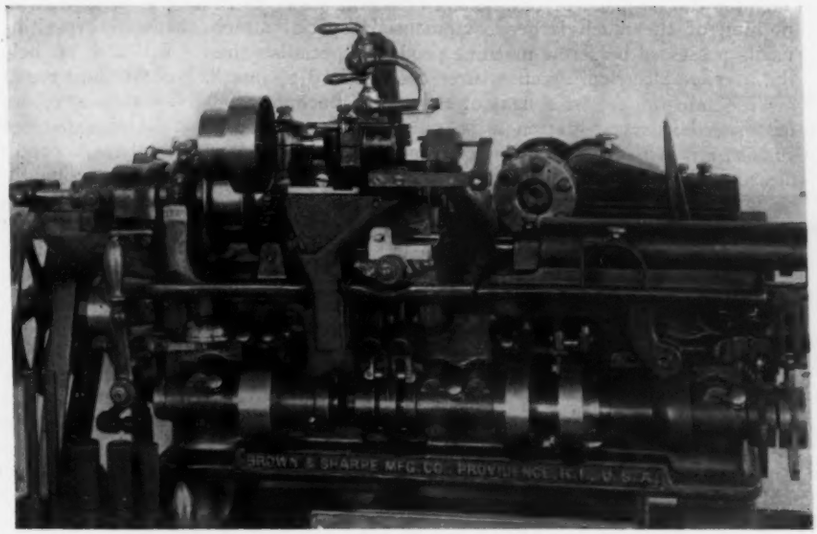
arm picks them up and transfers them to the attachment, where the secondary operation is performed without at all interfering with the continuity of the machine's principal function. Commonly used attachments are those for sinking the screw-driver slot in screw-heads, which device is also serviceable in light milling operations; index drills for drilling one or more holes crosswise; and a device for removing the burr that adheres following the cut-off, thus eliminating subsequent manual cleaning. Hobbing, milling and cross-drilling may be classified among standard attachments, but as these operations necessitate stopping the machine's primary function, they are often more economically performed separately.

In a class by themselves are the many special attachments. These are designed to make possible the economical production of electrical parts when quantity requirements justify the cost of such installations. For parts that call for more than one operation, magazines have been developed. From these they are more or less automatically fed to the tools set up as second operation attachment, the character of the arrangement being determined by that of the parts. Straight studs and short shafts without shoulders drop onto a carrier that brings them in line with the chuck, which is automatically closed and opened following the operation, when the finished part is ejected. Parts that will not roll in a straight path are transported by a transferring arm.

There are parts that are not suited for magazining. They must be handled semi-automatically, an operator being required for each machine, whereas in straight automatic work an operator takes care of a battery of machines. In the semi-automatic work the operator loads an inserting tool in the turret by hand. In some plants an automatic stopping device halts the machine after a cycle of operations, the work being placed directly in the chuck, after which the machine is started and the operations are performed automatically. In the intervals between loading the operator arranges the parts for speedy and accurate feeding to the machine, which requires very little time.

The question of when an electrical part warrants investment in special attachments and magazines and when it does not depends, of course, chiefly upon probable quantity requirements. Quite frequently designs may be modified so as to lessen cost of screw machine production of parts by eliminating too costly special attachments and magazines. Tolerances in parts are frequently held to more exacting limits than actual service requirements call for, involving enhanced production costs without commensurate benefit. Electrical engineers and designers think frequently only in terms of the assembled appliance which they plan, and lose sight altogether of the economies that might be effected by keeping in mind the relative cost of materials and of processes necessary to transform the latter into electrical parts.

Whether the electrical manufacturer fares better in having his parts made by an automatic screw machine products specialty plant or by installing his own machines is another question that obviously cannot be answered categorically. Again quantity requirements have a most important bearing on the answer, but other considerations loom almost as high.



This machine is an example of the automatic screw machines in common use today for fabricating metal into small parts. It fashions an endless variety of shapes and is so constructed and operated that it maintains accuracy to 0.002 inch

WHETHER the electrical manufacturers' parts requirements lie in the direction of heavy castings for motors or tiny knobs for radio rheostats, his interests are directly affected by the steady progress that is being made in metallurgy and metal working. If he wished to keep abreast of the details of that progress, he would find no time to devote to his own business, which is the manufacture of electrical appliances. By maintaining the right sort of cooperative contact with reputable castings manufacturers, screw machine products specialists and makers of metal products, however, he can keep himself informed of the high lights of this progress, especially those developments that directly affect his own advancement

Take the matter of scrap alone. In the large screw machine products plants, the rational disposal of the scrap turnings keeps a squad of men busy. This together with the recovery of the oil adhering to the parts as they come from the machines, by means of oil extractors, constitute activities upon the proper administration of which the use of black or red ink in the profit and loss statement may depend.

In such highly specialized plants, sorting, inspecting and kindred control work can be carried out by unskilled labor, because heavy tonnages permit of highly organized supervisory checks, mechanical as well as managerial.

Purchasing agents for such specialized plants are constantly abreast of every development in the metal markets, and can take advantage of every fractional decline. One of the largest of these establishments has the added advantage of being also one of the important factors in the construction of the machines and attachments.

As against these advantages, the electrical manufacturer having his own machines enjoys, of course, the usual benefits of being integrated in the matter of his supplies, quality being under his own supervision and delivery delays being precluded. Whether these latter considerations offset the economy in plant investment, with its inevitable depreciation, together with the benefit of the competitive sources of supply which outside contracting for screw machine products affords, is a problem for the individual electrical manufacturer's decision.

Due weight in its consideration, however, should also be given to the fact that the technical cooperation of the screw machine products specialist with the electrical manu-

facturer can be made of real dollars-and-cents value, to say nothing of the much larger equipment of special attachments possessed by screw machine products specialists than the average electrical manufacturer could afford to install.

To obtain the fullest benefit of the screw machine products specialist's cooperation it is, of course, necessary to furnish him with more than the conventional blueprints and measurement specifications. Very often, if the screw machine products specialist had before him the appliance into which a part or different parts are to be assembled, greater accuracy where accuracy is vital would be the result.

Drawing, Forming and Stamping

AN increasing number of metal-working plants combine the production of electrical stampings with that of screw machine products. Besides the relatively large brass stampings which are used by lighting fixture manufacturers in the form of ceiling plates, etc., the electrical industry uses an almost endless number of small metal stampings in contacts, base and face plates, blades, telephone parts, etc.

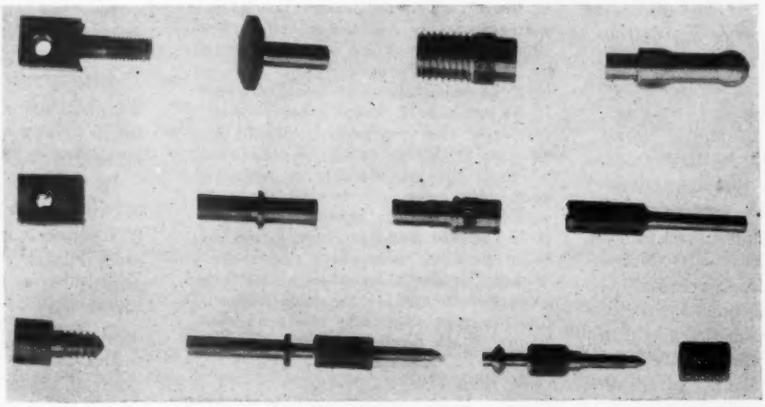
Much confusion results from the prevalent loose use of the names of the various metal-shaping processes. In drawing, a metal disk is forced through a die by a punch, emerging in cup or shell shape. By means of redrawings, the shell is elongated until the desired length is attained.

In forming, the metal is forced by a punch into a depression in the die, the punch being the reverse of the die design.

In stamping the punch, with a sharp blow, shapes the metal into the die, whereas in the former processes the punch descends steadily in a piston-like manner.

Stamping, therefore, is a quicker process than drawing or forming, the force of the blow from the punch causing the shell to rebound from the die.

Drawing, forming and stamping, however, are carried out in presses, and the basic tools are a die and a punch. Moreover, mechanical refinements have resulted in the use of so-called triple-action dies, combining all of the processes mentioned, and bringing forth in one operation of the press such parts as canopy shells used in wall lighting fixtures.



To obtain the utmost benefit of the screw machine products specialist's cooperation, it is, of course, necessary to furnish him with more than the conventional blueprints. A sample of the appliance is often helpful to the specialist

Steel, copper, aluminum, nickel, brass and bronze parts may be produced by press-working. Electrical manufacturers will do well to ponder some of the very pretty problems which this sort of metal part production brings to the front. Ordinarily a manufacturer is quite apt to say, when brass is suggested for a part that might be made of steel:

"Why brass which costs four or five times as much as steel?"

And yet there are shapes that can be formed cheaper of brass than of steel, because of the fewer number of draws that brass requires as compared with steel. Brass and copper must be annealed following each operation of the press or between every two operations, while aluminum requires less annealing and can be drawn more than any other metal.

Again, the specialist is in a position to suggest designs for parts that will permit the minimum number of draws, thereby resulting in decided production economies. He will also be helpful in the choice of the proper metal to obtain best results at the least cost. Dies may be laid out, so as to save or waste metal.

Antiquated notions regarding metals are apt to be very costly. A good many manufacturers who buy steel parts only occasionally and have no expert advice on the subject, cannot rid themselves of the idea conceived in their youth, that the noblest steel product is a forging. For centuries, working of steel with a hammer was supposed to impart to it merits that could not be obtained in any other way. When we speak of forgings nowadays, we mean, as a rule, the product of a hydraulic press that forces the metal into shape through a steady squeeze, and in which the hammer of Tubal, the Bible's "teacher of artificers in brass and iron," has no part.

Just among ourselves, let it be said that in point of quality the product of the hydraulic forging press has the hand-hammered product backed off the map. What is more, however, astute steel buyers today are no longer willing to pay for hammer-forging or hydraulic pressing when modern heat treatment, much cheaper than forging, will break up the large crystals in the steel's structure, and that, in non-technical language, was really the object of hammer-forging.

Advantages of Cooperation

AN authority on the metallurgy of iron stated recently that the day was not far off when through the production of *pearlitic iron*, gray iron castings would, except in point of elongation, have the same properties as do malleable castings now. If this proves true, it will have a direct bearing on the cost of magnet yokes in direct current motors and generators, to say nothing of blade shanks of ceiling fans and numerous other parts.

It is obvious then from the foregoing discussion of the various methods of making electrical parts and the materials from which they are made, that the electrical manufacturer cannot well afford to remain totally in ignorance of the possibilities of improving his own product, by reducing the production cost through those means which are found to be the most suitable. Each particular case must be investigated thoroughly in order to determine just what materials and processes will enable the manufacturer to place his product on the market embodying the highest quality at the lowest price. As was previously mentioned, every electrical manufacturer can well afford to keep in touch with the developments in the parts making industry and he will find that a large acquaintance among the parts makers will be invaluable to him.

If the parts maker is constantly in touch with the new developments in the metal markets, he can take advantage of them to enable the manufacturers he supplies to obtain parts at a lower figure. This is just another point which justifies the manufacturer taking advantage of the opportunities offered him by the specialists.

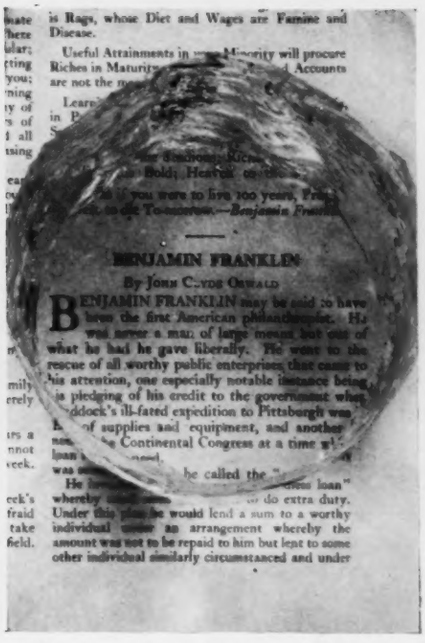
If Glass Is Not Suitable, Why Not Try Fused Quartz?

This substance has been made on a commercial basis for the past several years

CLEAR fused quartz, for several years now obtainable in large quantities and in relatively large masses, is regarded as superior to glass in many respects and as suitable for service in many places where glass cannot be used. It transmits wavelengths covering a wide range in the spectrum and has an extremely low thermal expansion. At the right are its inventors, of the General Electric Co. Left to right: L. B. Miller, P. K. Devers, Wallace Wright and E. R. Berry. Dr. Berry is examining a lens blank of clear fused quartz

Light Travels Around a Corner

MR. WRIGHT is reading a newspaper by the light of a flashlight held under the edge of the table. The photograph is a ten-second exposure, with no illumination other than that from the pocket flashlight



BENJAMIN FRANKLIN

By John C. Ovde Oswald

BENJAMIN FRANKLIN may be said to have been the first American philanthropist. He was never a man of large means but out of what he had he gave liberally. He went to the rescue of all worthy public enterprises that came to his attention, one especially notable instance being his pledging of his credit to the government when Braddock's ill-fated expedition to Pittsburgh was [illegible] of supplies and equipment, and another [illegible] the Continental Congress at a time w[illegible] loan [illegible] was [illegible] be called the "[illegible] loan" whereby [illegible] do extra duty. Under this plan he would lend a sum to a worthy individual under an arrangement whereby the amount was not to be repaid to him but lent to some other individual similarly circumstanced and under

Through Nine Inches of Quartz

THE remarkable transparency of fused quartz and its freedom from air bubbles is illustrated by this picture, showing that type can easily be read through nine inches of this substance. The ends were polished

Heating Clear Fused Quartz

WHILE the end of this piece of fused quartz becomes incandescent in the intense heat of any oxy-hydrogen flame, the side of the rod remains cold so that it can be handled by the fingers without danger

Are Electrical Manufacturers

ELECTRICITY on the farm pays for itself twice over, says R. F. Bucknam of the New York College of Agriculture. Universities and central stations are cooperating in extending the use of electricity on the farm. Does the electrical manufacturer fully realize his responsibilities in this expansion of electric service?

The Farmer Needs Portable Motors for His Work

IN many cases electrical equipment for use on the farm does not mean a transplanting from urban to rural conditions, but rather a new development. The farmer is being educated in the uses of electric power to lighten his labors. In the picture above he is using a portable motor to run his circular saw—a large improvement over old-time methods of sawing wood on the farm

Publicity Is Now Expanding the Rural Sales Field

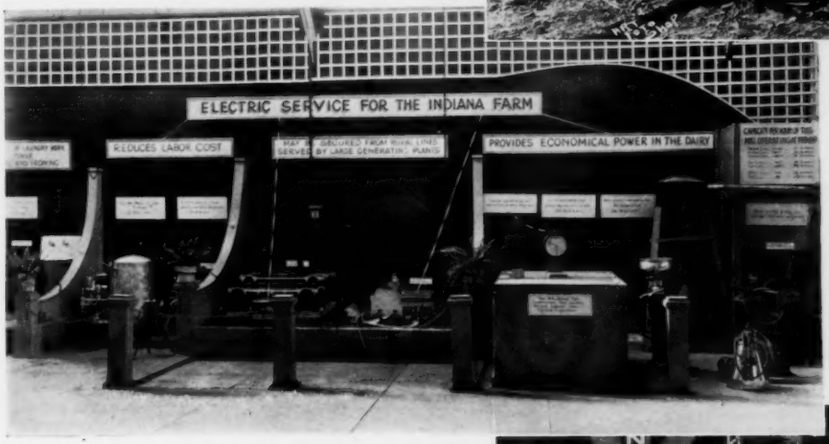
THE sign at the top of the display illustrated at the left tells the farmer that electric power will help him to make profits from his poultry. Above is illustrated another display which was made by Purdue University at the Indiana State Fair—an example of the service which universities are performing for electrical manufacturers in cooperating with central stations in promoting rural electrification

Lead a Horse to Water, But Will He Drink?

THE central station can bring electric power to the farm, but the farmer must have apparatus by which that power can be put to work for him day by day. It is the manufacturer's job to supply that apparatus—apparatus definitely adapted to the farmer's needs. The illustration at the right is a view of another state fair exhibit which creates desire in the farmer to use the services of electric power as his "hired man"

Going After the Farm Market?

IT is not enough that the electrical manufacturers have for sale equipment which will use electricity for farm purposes. It must be equipment which studies and tests show is peculiarly adapted to farm requirements. The pictures on these two pages are sharp reminders of the manufacturer's opportunity in this field of service



An Opportunity to Supply What the Farmer Needs

COOPERATION by electrical manufacturers with the central stations and universities which are extending the use of electricity on the farm is highly desirable. Farmers like those who are using a motor for threshing in the picture above know just what electrical equipment must be able to do if it is to be efficient for their purposes—and the manufacturer must provide this apparatus

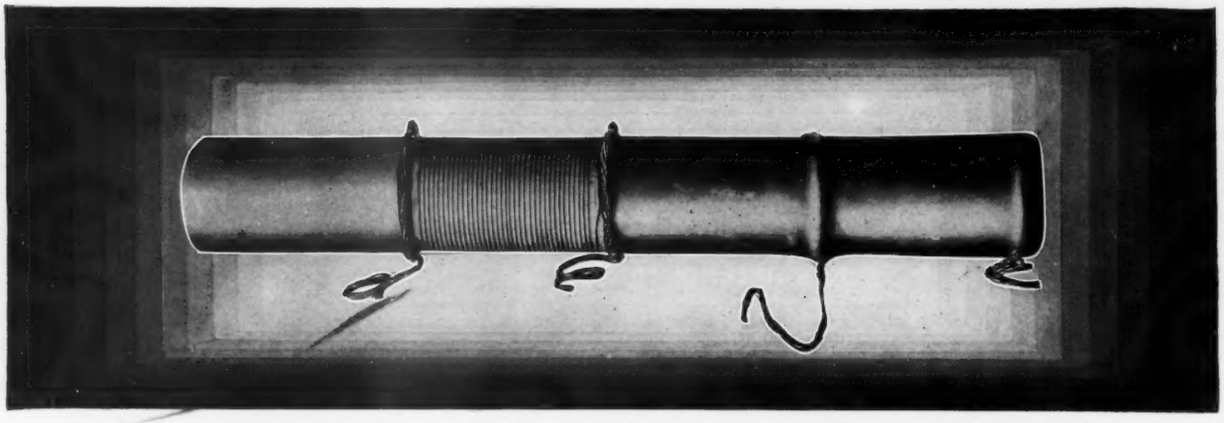
Electrical Dairy Apparatus Makes for Economy

ONE of the signs in the rural electrification display above reminds the farmer that electric power provides economical service in the dairy. The appliances and apparatus designed for dairy purposes, and for all other farm work, will sell best only if they are the product of men who know the peculiar problems of the work which the apparatus is supposed to do

In Rural Electrification Lie Potential Sales

ABOVE and at the left are two views of a model electrified farm which have been displayed by Iowa State College at various fairs and exhibitions. This is merely one symbol of the manner in which educational institutions and central stations are tilling the rural electric sales field for the manufacturer who makes a specialized effort to capitalize on the merchandising opportunities thus developed for his products

VITROHM RESISTORS · · · IN EVERY INDUSTRY · · · IN EVERY LAND

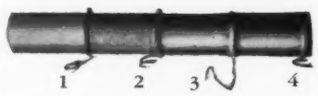


The Vitrohm Resistor

Is a Thoroughly and Accurately Engineered Product

THIRTY-SIX years ago, Ward Leonard Electric Co. placed upon the market the Vitrohm Resistor. This new unit was developed to meet the need for a resistor which would dissipate more energy continuously without deterioration and failure than the types then in use.

The Vitrohm Resistor was made then by winding a resistance wire upon a refractory base. The resistance wire and terminal contacts were coated with fused-on vitreous enamel of special composition. The purpose of the firing and enamelling was fourfold: heating the unit to a temperature in excess of any which would be met in actual service "aged" the wire, thus preventing molecular changes during use; the enamel protected the resistance wire, it conducted the heat rapidly away from the wire to the air, and it increased the effective radiating surface of the resistive element from the area of the wire alone to that of the entire surface of the enamel covering the resistive element.



1. The Vitrohm refractory tube, prior to winding and enamelling.
2. A section of the refractory tube upon which has been wound the special resistance wire.
3-4. Sections wound and enamelled. These sections, if independent of the other two, would now be classed as a Vitrohm (vitreous enamelled) Resistor Unit.

The theory of Vitrohm construction is the same today as it was 36 years ago.

Methods, materials, and production facilities have kept pace with the insistent demands of the electrical industry.

Our research and development department is one of the largest and busiest of Ward Leonard's engineering divisions. Our slogan "36 years of resistor experience" does not designate "static" experience. It means the day-by-day and year-by-year growth of knowledge and skill which is yours with the purchase of a Vitrohm (vitreous enamelled) Resistor Unit.

WARD LEONARD ELECTRIC CO.

MOUNT VERNON, NEW YORK

Manufacturers Must Help to Solve Their Dealers' Problems

Those problems lay upon producers a vital responsibility which they must work to fulfill

By Benjamin Gross

President, Gross-Brennan, Inc., New York and Boston; Representative Stromberg-Carlson Telephone Manufacturing Co.

THE final outlet for the products of a radio manufacturer building receivers is the dealer, regardless of whether the manufacturer is merchandising through-the-jobber or direct-to-the-dealer. Therefore, the dealers' problems, and particularly their shortcomings, are a vital part of the manufacturers' problems. Many of these dealer problems will eventually, if not tackled soon by manufacturers as a group, become effective in retarding natural growth of the industry as a whole. The jobber is able to go only so far in dealer problem solutions as the manufacturer behind him shows the way. The dealer, in the final analysis, represents the manufacturer, not the jobber, and is closer to the manufacturer than the jobber as respects actual sales results. Goods are not sold when they go to the jobber, or from him to the dealer, but only when they reach the consumer's hands. Therefore, the manufacturer has a vital interest in the dealer, and in helping to solve the problems of the dealer.

During recent years many radio manufacturers have learned that they cannot ignore the dealers' problems and at the same time build a permanent business for themselves. This recognition has been first evidenced by a broad acceptance of the so-called "franchise system." The idea of the franchise grew out of the desire to select desirable dealers. In radio what most franchises said was quite far apart from what they meant, and the majority said nothing that protected the manufacturer, the dealer or the public. The manufacturer almost invariably talked about the value of the franchise and that a few were still available. In most instances, however, the franchising consisted of just taking the dealer's order and handing him a show card which, in appearance, looked like an oil or mining stock certificate. Much depends on the will and courage of the manufacturer behind the franchise. There is one important thing that the dealer must learn, and that is, that the more "don'ts" there are included in his franchise the more protection is in it for him. The more freedom of action he has, the less is the agency worth. The manufacturer, likewise, must learn to include restrictions. Otherwise, the dealer cannot logically develop the value of his franchise. Once set down, the terms must be religiously carried out in every detail, or soon the entire plan breaks down.

A most important problem a manufacturer faces in dealer distribution is the matter of proper and adequate representation. This is a broad heading and there is a great deal that can be said on this subject. The question is, "How many lines *can* the dealer handle and at the same time give adequate representation?" Consideration must here be given to the dealer's capital and credit standing, the size of his store, the strength of his organization, his executive ability to manage his business, the scope of his service department, the methods he uses to create sales, etc. The greatest fault in the dealers' picture today is, unquestionably, too many lines per dealer. Manufacturers and jobbers are crowding dealers to the point where they destroy the possibilities of getting intelligent, honest and safe dealer representation. To spread the average dealer's attention over too great a diversity of lines is to destroy the possibilities of sales building and weaken the merchandising structure of the entire industry. It makes pure order-takers of the dealer's organization. It creates confusion, destroys concentration, eliminates public confidence in the dealer and obstructs growth of incentive to do a good, clean job on any one line. Are radio manufacturers building the industry on a safe, sound or constructive basis when they permit and even encourage such an aimless practice? The right answer takes only one guess. Most all have been talking franchise and selective dealer plans. Now start a campaign for a selective choice of lines by dealers. Then quality of representation will improve. There is no more a need for any dealer to carry every popular line than for any manufacturer to sell every dealer. How can a dealer carry the complete line of each manufacturer if he represents six, eight, ten or more? Yet how good is his representation for any manufacturer if he hasn't the entire line? Where is the proper return from the manufacturer's advertising to come from if the public cannot see whatever model an advertisement might interest them in? How much are the dealer's men interested in any particular line if but part of it is on hand? Why create broader lines to help the dealer cover a wide field and then not demand that he carry the complete line? Any manufacturer will get further ahead with less dealers, and more thorough ones, by such a procedure.

GOODS are not sold when they go to the jobber, or when they go from him to the dealer. Goods are sold only when they reach the consumer's hands. This seems to be an elemental truth about merchandising which everybody engaged in it ought to understand. But this article shows what that bit of merchandising truth means to the manufacturer who does not realize his full responsibility to help the dealer move his goods.

THE EDITOR

Fewer lines by the dealer means better and more complete display, prompter deliveries to the consumer, more intelligent and effective selling by his sales help, more efficient service work, less price cutting, more net dollars profit to the dealer, better credit conditions, more business to the manufacturer and a sounder industry for the future. This is all even a more serious problem this year than ever before, because most lines are getting broader. Beware of the dealer who carries conflicting lines. He destroys the returns from your advertising investment.

Another difficult problem is dealer discounts. The history of the trend of dealer discounts is too recent to warrant review. The tendency of promiscuous increase in discounts

to the dealer leads to no good. It does not stay with the dealer unless the manufacturer dictates how that extra discount shall be applied. The dealers claim they need more discount to run their business properly. For an efficiently, properly run business, that may be true. But how many are run both efficiently and properly? The added discount does not increase the volume of business permanently for any one manufacturer. Someone else soon matches it or goes it one better. We have all heard so much from the dealer as to just what he needs to run his business and make money that it is high time manufacturers started doing something tangible in the way of directing the dealers' expenditures. The dealer must be taught to study his costs. to use his margin on a budget plan and build a permanent business and not just a cut-price following. The dealer out of his margin should maintain a capable and adequate service organization; pay the kind of salaries or commissions to the sales help that will enable him to get and hold the right kind of men; do a definite amount of consistent advertising; pay himself a fair salary and then leave a decent profit to add to his surplus at the end of the year. Then he is building a permanent business for himself, as well as for the manufacturers he represents. This all sounds like the millennium. But is it impossible?

¶ The manufacturer should help the dealer to understand just what he is in business for. The manufacturer should even go so far as to force his dealers to make a success of their business

Help the dealer to understand just what he is in business for, and go so far, if you please, as to *force* him to be successful. The manufacturer who does this fearlessly will in time reduce the constant demand for greater discounts and bring about the kind of price maintenance that the Federal Trade Commission will praise and not condemn.

The trade-in problem is becoming a rather serious one for the dealer. Some help is urgently needed. The average dealer hasn't the least idea what he really can afford to allow for an old receiver. There is no standard. The public is taking mean advantage of this weakness in the retail radio structure and breaking down sound selling principles. I have seen some dealers allow as much as the original consumer price of an old set where it equals half his margin on a new sale. The trade-in may be worth 10 per cent of its original price, but he thinks he made money on such a transaction. His reasoning is, that if he didn't take the sale his competitor would, and inasmuch as his fixed expenses go on just the same, he may as well grab the opportunity while the grabbing is good. The cure-all no one can prescribe. I would, however, recommend that "trade-in standards" be prepared, as has been done in other industries. Now, this is not an easy thing to do, but it might be in the right direction. Something must be done for the dealer in such an official capacity that the public will accept it as fair and reasonable. The dealers individually, or even their local associations, are not strong enough to control this condition, and they should have the help of the manufacturers' association. There are a few drawbacks to a plan such as this, but inasmuch as some plan is needed so badly, a beginning now, no matter how crude, would be better than none. It would eventually lead to a solution.

When it comes to the problem of dealer credit standing, manufacturers might ask, "Of what import is dealer credit to us when we sell only to jobbers?" How long is jobber credit going to be good if dealer credit is on the down grade? If dealers, by and large, steadily demand longer terms and become more and more slow pay, isn't the day near at hand when jobbers will *need* longer terms? Are radio manufacturers going to permit the industry to slide into the conditions that exist in the piano game, where many manufacturers sell wholesale on terms as long as a year, and even two or longer? It does not take very long for bad habits to become worse and soon chronic. We already find jobbers, and some very prominent ones, giving dealers 90- and 120-day terms, selling dealers on notes and even consigning goods. Most manufacturers are too busy with their own immediate problems to study into the real field situation. Some direct cooperation between the manufacturers' association and local credit bodies, leading to systematic general training of the dealer, would be a real constructive work. Such matters as the proper use of window displays, effective distribution of the manufacturer's literature, dealer help education, economical local advertising methods, maintaining of all sorts of essential records, etc., would, if consistently propagated, strengthen the whole industry.

Just on the matter of essential records, you would all be amazed to know how inefficiently ninety-nine out of every hundred dealers maintain any real data. Even some of the largest and presumably most capable have no useful list of their customers that can be used for specific follow-up work. Many say they have, but when you want them for any special plan of campaign the records must be dug out; it takes so long to get them that the campaign is soon dropped. What sort of real concentrated sales effort on the part of the final outlet—namely, the dealer—can the manufacturer expect under such conditions? Therefore, to say that this is just a local problem is merely to deny its existence. The administration of the details of such work is local, but its coordination and planning is national.

Consider the credit problem, also, from another angle. The average dealer's capital investment in radio, whether it represents his whole business or only a department, is limited to the point where it is barely enough to carry the necessary floor and window display samples and his demonstration outfits of any group of three well-selected and non-interfering lines. In a well financed business, the necessary display and demonstration equipment for good representation must be looked upon as a fixed capital investment, just the same as the fixtures in the store or the delivery truck. Credit extension is intended to cover turnover only. This is the first point on the subject of credit that is being sadly overlooked. Then there is the matter of carrying of time payment sales. Even if the dealer uses a finance company, he still must carry his equity on each contract, as well as delinquent payments. The more business he does, the greater is the amount of his accounts receivable he himself must carry to cover these items, as well as stock replacements.

¶ Dealer service to the public is one of the most vital problems with which the manufacturer has to contend. The dealer must know how to give customers any and all forms of service they require

It is therefore evident that the more lines that a dealer carries than his capital permits soon means inadequate displays, switching customers from one line to some other on which he can get easy credit temporarily, breaking down the morale of his organization, cutting prices to meet bills due and past due, stagnated stock in jobbers' and manufacturers' hands, and sooner or later a creditors' meeting.

Dealer service to the public is one of the most vital problems with which the manufacturer has to contend. All sorts of plans have been tried, but basically only one plan can be permanent, and that is for the dealer to learn how to give any and all forms of service. Such plans as factory men in the field, local authorized service stations, jobbers

doing special service work for dealers, shipping alleged defective sets back to district offices or to the factory, direct outright replacement of chassis, and so on, have been and are being tried. All these and other schemes fashioned along these lines only help to destroy public confidence in dealers in general and radio products in a broad sense. They tend to weaken the dealer, make him lean on the manufacturer or the jobber and become less and less self-reliant. When a dealer has been so well trained that he can attend to any problem that arises in the operation of a receiver or the accessories, his customer gains real confidence in the supplier, and even more so in the manufacturer of that particular equipment. On the other hand, apply any of the other methods, where the dealer is relieved of his responsibility, then both the dealer and the manufacturer, together with his product, are soon condemned by the consumer of their lines of products.

Another growing problem to the manufacturers is the steady growth of chain organizations handling radio. The merchandising excuse for the existence of chain organizations is lowered cost of operation through increased efficiency of buying and distribution. This may be true in drugs, groceries, men's shorts, candy shops, cigar stores and the like; in other words, in so-called over-the-counter products. But radio is a floor-selling and in-the-home selling product. In our experience, chains selling radio tend to become more inefficient the larger they grow. There are some exceptions, but mighty few. Branch store managers have too many duties and are seldom trainers of men. The sales help are compensated on all sorts of bonus plans, without a consistent aim. They get none or little individual attention from the real executives and no incentive to be other than just order takers. Unless these chains are taught to do a good job, they will, in time, be less and less of a factor for the manufacturer. Yet we find many instances where manufacturers spoil these chains and make them still worse by extending jobber discounts and unusual favors.

¶ It is the business of the manufacturer to guide all his sales outlets back to sound profit-making policies, and then to help those outlets to stay in that condition of healthy business

What does all this amount to in the end? Actually, to little more than breaking down of confidence in the manufacturer by the individually owned shops. Take the total volume of most any chain, divide by the number of stores they operate and you will find a great many dealers with one store doing a bigger job pro rata. I do not mean to imply that important chains, well managed, do not deserve real consideration; but what I wish to point out is, that there is too much being taken for granted, with the result that jobber discounts and special favors when given usually only make matters worse. It only makes for greater inefficiency and careless retail merchandising. The chains need just as much training and attention as the individual dealer, regardless of their size or age and often even more. Properly developed the chains can some day become a much stronger permanent outlet for manufacturers in general than they now are. But they should be made to earn their way to better deals by good work already done; then they will appreciate what is done for them and do a profitable job for themselves and for the manufacturers whose lines they handle.

Practically the same can be said also for department stores in general. Radio has been a sort of fifth wheel on the wagon, a stepchild, in department stores. No real attempt is made to capitalize the tremendous following that these great stores have. Most have charge accounts running into many thousands. To get one of these stores to circularize consistently their precious list of customers one must be a Houdini, not just a mere salesman. I question sometimes whether the average department store really wants to make a profit out of its radio department. All that most of them constantly seek is something to advertise as a sensational sale or an unusual price combination planned to bring crowds into the store. It is up to manufacturers to guide them back to sound profit-making policies so that these department stores can set the pace in good merchandising for the rank and file of dealers. The problem of credit in relation to too many lines in chain stores and department stores is not a factor because their credit is usually unlimited. All the other detrimental conditions created by too many lines however, are even more applicable here than with the rank and file dealers. Manufacturers bidding for chain and department store business by extension of jobber discounts and special favors destroy the value of these large institutions for all the others. They spread the attention over too great a field, eliminate concentration and shift the attention of these large and sometimes unwieldy organizations from one proposition to another frequently. There can be no greater waste.

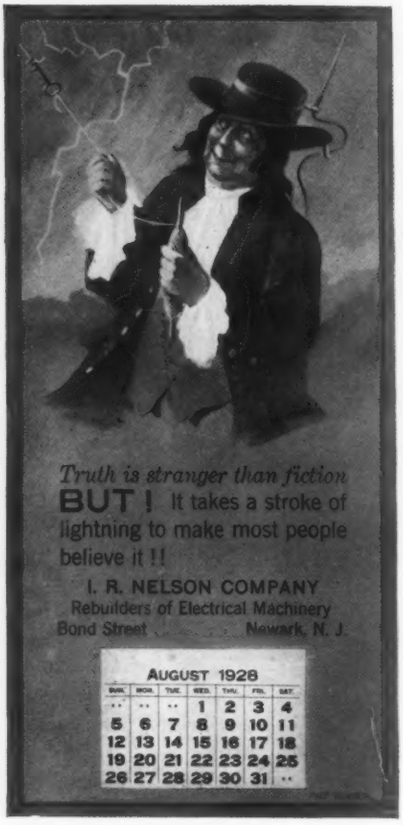
¶ The predicament of the dealer who handled too many lines of radio because he thought he needed credit from more sources, and how he explained the fact that he had become "slow pay" in this curious process

The problem of the dealer's carrying more radio lines than he can handle as a sound business proposition and with a fair certainty of profit to himself and all others concerned is, as I have said, a serious one.

Along about the months of February or March in each year, one hears throughout the radio field resolutions by dealers that they are making their plans to handle just three or four lines of radio during the next selling season. If the matter stopped there, conditions might not be so detrimental to the interests of manufacturer, jobber and dealer alike. But in June, since the advent of the radio trade shows during that month, these dealer resolutions go by the board, and we hear of too many cases where the "three or four lines" have become "five or six lines." By the time of the fall shows for the consuming public, the situation is too often back again to as many as ten lines which the dealer thinks, for some reason or other, that he can handle with some sort of success, but usually finds that he cannot.

Here is an example which illustrates one of the many reasons why a dealer cannot handle so many lines with any real profit to anybody concerned in the merchandising of radio. Recently we had a dealer in our office to explain his slow payment. He carried nine lines. At the beginning of the radio year he listed four that he intended to carry. His explanation was that he needed more credit than he was entitled to on the four lines alone, so he added the other five lines. He spread his business thinner. In view of his restricted capital we asked him why he needed such-and-such lines. He said that when a customer asked him if he had a Smith set he could say he had it and then sell him what he, the dealer, wanted him to buy. That was a sample of fine salesmanship, all created by having too many lines.

These and many similar problems are not just local or merely theoretical, but are fundamental and national in scope. On their solution depends not only the success of the radio manufacturer, but also the success of the radio industry itself.


Truth is stranger than fiction
BUT ! It takes a stroke of lightning to make most people believe it !!
I. R. NELSON COMPANY
Rebuilders of Electrical Machinery
Bond Street Newark, N. J.
AUGUST 1928
SUN. MON. TUE. WED. THU. FRI. SAT.
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31

This is one of the "But" series of calendars being sent out by the I. R. Nelson Co. at the present time. This particular series, which was initiated by Mr. Nelson and is written by him, has proved exceptionally effective

BUILDING Repair with *Advertising*

I. R. Nelson Company of Newark, securely established concern by fol and taking an active rather

By H. L. Holcomb
Associate Editor
Electrical Manufacturing

THE I. R. Nelson Company does a large motor repair business within a radius of 500 miles of its headquarters on Bond Street, Newark, N. J. This is one of the oldest and best established companies in that section of the country. By ingenious advertising, constant soliciting and always rendering good service, this organization has built up an unusually large patronage.

This repair shop has been in existence for twenty-two years and has been incorporated for the last ten. Its president is I. R. Nelson, Sr., who has been connected with the electrical industry for forty-seven years. However, those most active in the administration of the corporation at the present time are Mr. Nelson's son, E. F. Nelson, treasurer, and J. C. Catlett, general manager and assistant to the president. Other officials of the organization are Ira Nelson, secretary, and Howard Philips, vice-president.

In addition to controlling the motor repair shop, Mr. Nelson and his two sons, E. F. Nelson and Ira Nelson, own radio broadcasting station WAAM under the name of the WAAM Corporation. Although the I. R. Nelson Company does no advertising over the radio, the fact is known that the repair shop is managed by the same persons as operate the broadcasting station and this gives it much desirable publicity.

For years the Nelson company has carried on a campaign of direct mail advertising on a large scale, and it is to this that the company officials credit the large volume of business. Mr. Nelson, Sr., has always made this advertising his hobby and he personally writes all of the copy and supervises its make-up. The exact form that the advertising takes is a series of monthly calendars and bulletins.

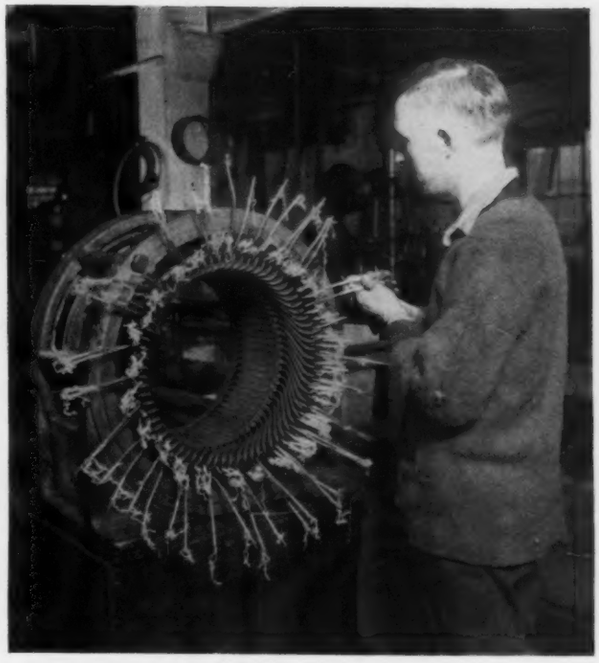
When the I. R. Nelson Company was first formed, yearly calendars were mailed out to its customers and prospects. Mr. Nelson continued this policy for the first three years and then commenced to send out the calendars monthly. This system he has continued until the present time. Each calendar consists of an attractive picture under which is a cleverly written caption. There is also on it the name and address of the Nelson company and the calendar dates of the current month.

The space on the back of the calendar is taken up with an advertisement of the company. On one of these the following appeal was made: "We make our living repairing electrical machinery. Consequently we are not prejudiced for or against any particular make or type. *Our very existence depends on the quality* of the work we do, and our shop is

Above is the armature winding room on the first floor of the Nelson Building. In the background to the right is the machine shop. In the foreground is shown the transformer pit which was designed to give plenty of head room for removing coils from the tanks

Shop SUCCESS and *Soliciting*

N. J., has developed into a lowing sound business practice than a passive attitude



Here is an A. C. motor in the process of being rewound. The coils are already in the stator. The flared-out leads are the excess wire which is used in the poling of the machine

equipped with the best up-to-date machinery, and men specially trained for this class of work. First-class tools and first-class workmen lower first costs."

One of the main features of the Nelson advertising is the mailing list used for sending out the calendars and bulletins. It contains the names of all customers and prospects within a radius of approximately 500 miles of Newark, N. J. This list is kept up-to-date by the company's solicitors. Four members of the organization act as solicitors for part of the time and there are always at least two of them out looking for business.

The card index of prospects' names is arranged alphabetically by cities. When a solicitor starts out on a trip, he takes with him all the names of the companies which come under the cities in the territory he is sent out to cover. If he uncovers any new prospects he has the names added to the regular index system. This thorough method of keeping after business has shown excellent results and more than pays for itself in work secured.

The Scope of Work Done

REPAIRING motors and generators is not the only work done by the company. It does an extensive business in the manufacture of coils. It specializes in providing these for mining companies, and in this line competes directly with the large electrical manufacturing companies. The shop even makes hand wound coils which cannot be machine made.

Transformers of all sizes are repaired and rewound by the company in its special transformer room in the basement of its three-story brick building. Lifting magnets are repaired. Separating magnets are manufactured on order. Small transformers with an output of from 50 to 150 watts are made. During the War, the company had a contract with the Navy Department for doing the motor repair work on all of the transports which docked at Hoboken, N. J.

Exclusive of office force, the I. R. Nelson Company has about fifteen men constantly employed in its machine shop. For years there has been very little change in the personnel. The result of this is that the company has an efficient organization which can be depended upon to handle any situation that comes up. All the workmen are skilled in all phases of machine shop work.

Mr. Nelson has always developed his own employees and has taught them to do every type of work required in motor repairing. This makes his organization very flexible and he can put the men on the jobs that need pushing. His men are qualified not only as shop men but also as "trouble shooters" at the plants of customers in case of an emergency call.

There are several armature winders in the company's employ who wound armatures by hand before the years of machine winding. Having these men enables the shop to accept work that requires hand winding. This is a field in which few shops can compete with the Nelson company.

Few plants have such a small labor turnover as this shop. The men stay with the I. R. Nelson Company so faithfully because of the excellent treatment they receive from their superiors. They are well cared for and every effort has been made to install machinery of the safest type so that there will be no accidents.

When the company was incorporated, the men were given the chance to buy stock in the corporation so that they would feel themselves more a part of the organization. Officials of the company bought up the stock and then sold it to the employees on the installment plan. At least three-quarters of the present personnel are stock holders.

The company has built three standard horseshoe pitching courts on its property for the use of the men at noon hour. Everyone from the president down pitches horseshoes together both during their lunch hour and after work. This rubbing of shoulders of the men and officials in leisure time has resulted in the development of a fine *esprit de corps.*

At times, the company selects a team of horseshoe pitchers from among its players and has contests with other shops. In addition to this there are regular company championship tournaments with prizes for the winners. The shop used to have a baseball team which played other organizations. This activity, however, has been dropped because of the fact that most of the men felt they were getting a little past the age where they could stand such strenuous sport regularly.

The Nelson company was the first one in its district to adopt the eight-hour day for its workmen. It was also the first organization to grant its employees a half holiday Saturdays all year around. This attitude on the part of the officials of doing everything possible for the happiness of their employees has more than repaid them by the willingness the men have shown in doing to the best of their abilities whatever is asked of them in the way of work.

Cranes have been installed to do all heavy lifting. The working rooms are large and well aired. No efforts have been spared to make the surroundings congenial. These

things spell the difference between disgruntled workmen and those who are willing to do just a little more than is asked of them.

When the personnel of the shop was still in the building stage a number of years ago, Mr. Nelson used to hire apprentices and put them through a regular course of training. Most of these boys came direct from vocational schools. They were taught first the easy tasks, and little by little were developed into all-around repairmen. The men thus trained form the background of the present Nelson personnel.

It has always been Mr. Nelson's policy to advance men of his own organization to fill any vacancies that occurred instead of looking for experienced men elsewhere. This expectancy of advancement has been an ever present incentive to his workmen, and he has lost very few of them.

This is the coil room. In the background to the right can be seen the reel racks. These are in line with the winding machines, making it easy to change reels—a task performed several times daily. The rack handles a large number of reels.

Most of the people who have work done by the Nelson company stay with it because of the excellent service they receive. Every piece of work finished by the shop is tagged: "We guarantee that this machine has been repaired with the best material and labor obtainable, that it has been thoroughly tested, and that we will make good without extra charge any defect developing through faulty workmanship or material within one year."

Many of the machines used by the company were developed by its own engineers. They had invented and the shop was using a quick acting form for coil group winding before the factories had them. This form is collapsible which makes it easy to remove the finished coils. Another machine which is a company development is a direct-drive, high-speed winding head for winding transformer coils. Fifty-eight coils of twenty-two pounds each can be wound in one full working day on this high-speed winding head.

The I. R. Nelson Company is located in a two-story brick building. On the second floor are the offices and the coil room. On the ground floor are the machine shop, transformer pit and general repair shop. In the basement is a transformer room for working on transformer coils. The rest of the basement is used as a storeroom.

The routing of work through the shop is very carefully planned and carried out. As soon as a piece of apparatus arrives at the receiving platform, it is labelled with a red tag marked with a shop order number. All work on that particular piece of machinery is charged against this number.

One of the winders examines the motor to see what repairs are necessary. He enters this information along with the customer's name, customer's order number and nameplate data on a card which is filed. Each employee who works on the motor makes out a daily time card for it showing the length of time he has put in on it and the material he has used on it. This information is transferred to a shop order card. This card is headed by the shop order number of the work. Below this is recorded the pay numbers of the employees who worked on the motor each day, the hours they devoted to it and the material they used.

These shop order cards are kept on file by the company after the work has been completed and shipped out. This is valuable to have in case the same piece of apparatus ever comes back for further work. It also makes it easy to estimate for customers the cost for repairing similar jobs. The man who tears down the motor fills out a data card containing such information as: number of commutator bars, coils, poles, etc. This card is also filed.

This workman is winding a pancake coil for a 360 kva. special transformer. This is a high voltage coil, and between the layers of wire there is placed a layer of fish paper insulation

Above is the rotor of an induction voltage regulator which is about to be dismantled for rewinding. The workman is starting to raise one of the old coils in order to remove it

Newly Elected Vice-Presidents in Charge of the Five Nema Divisions

N. A. Wolcott
Apparatus Division

M. C. Morrow
Appliance Division

C. L. Collens
Policies Division

L. B. F. Raycroft
Radio Division

W. E. Sprackling
Supply Division

Nema Elects H. B. Crouse President at Second Annual Meeting

Elections of all officials and members of the board were held at the annual convention, June 13

HUNTINGTON B. CROUSE was elected president of the National Electric Manufacturers Association at its second annual meeting at Hot Springs, Va., on June 13, to succeed Gerard Swope. Mr. Crouse is president of the Crouse-Hinds Company, Syracuse, N. Y., manufacturer of control apparatus. Mr. Swope, who is the president of the General Electric Company, Schenectady, N. Y., retains his membership on both the board of governors and on the executive committee of Nema.

Vice-presidents in charge of the various divisions were also elected. Clarence L. Collens was named to succeed himself as the head of the Policies Division. He is with the Reliance Electric & Engineering Company of Cleveland, Ohio. Louis B. F. Raycroft remains as vice-president in charge of the Radio Division. He is with the Electric Storage Battery Company of Philadelphia, Pa.

Other Elections

N. A. WOLCOTT was elected head of the Apparatus Division as successor to J. M. Curtin of the Westinghouse Electric & Manufacturing Company. Mr. Wolcott is with the Packard Electric Company, Warren, Ohio. W. E. Sprackling of the Tubular Woven Fabric Company, Pawtucket, R. I., was named as successor to D. Hays Murphy of the Wiremold Company, Hartford, Conn., as vice-president in charge of the Supply Division. M. C. Morrow of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., was elected head of the new Appliance Division.

Members to the board of governors were elected as follows: H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; R. Edwards, Edwards & Company, Inc., New York City; A. L. Eustice, Economy Fuse & Manufacturing Company, Chicago, Ill.; Otto H. Falk, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.; W. L. Jacoby, Kellogg Switchboard & Supply Company, Chicago, Ill.; J. F. Kerlin, National Carbon Company, Cleveland, Ohio; D. H. Murphy, Wiremold Company, Hartford, Conn.; R. J. Russell, Century Electric Company, St. Louis, Mo.; Frank E. Wolcott, Frank E. Wolcott Manufacturing Company, Hartford, Conn.

New Nema President

H. B. Crouse

The board of governor elections were for a term of three years. There was one unexpired term of one year which was filled by the election of I. A. Bennett of the National Metal Molding Company of Pittsburgh, Pa.

The members of Nema—which represents a preponderance of the electrical apparatus, supply appliance and radio manufacturers of the country, doing together a business of more than $1,500,000,000 a year—were enthusiastic over the election of Mr. Crouse as president of the organization.

Leadership Acknowledged

MR. CROUSE was one of the original organizers of the electrical supply manufacturers, and he is a charter member of the National Electrical Manufacturers Association. He is a member of the executive and policy, business policies and labor committees, and is chairman of the Nema finance committee.

He is a native of Fayetteville, N. Y., and is a graduate of Andover Academy. His father had established a business for the manufacture of panelboards and switches. He entered this and eventually succeded his father, assuming complete control in 1905. It is mainly through the foresight and energy of Mr. Crouse that the Crouse-Hinds Company holds the prominent place in the industry it does today. He himself has gained a position of acknowledged leadership in the industry.

Mr. Crouse's interests have always been such as to keep him active in supporting causes which were for the benefit of the whole industry—an example being his advocacy of the National Electrical Code.

Station G-A-G-E, Editor Speaking

Stanley A. Dennis, Editor and Assistant to the President

Is Your Association Support Justified?

ELECTRICAL manufacturers are called upon almost daily to help support financially the many local, sectional, and national organizations that exist in all groups in the industry. No one has ever yet found out exactly what the manufacturers spend collectively for the support of trade association work. The annual amount must, of course, run literally into millions. This sum, it must be remembered, covers everything from great national exhibitions to the payments of bills for local electrical picnics. One should not be surprised, therefore, to hear a manufacturer ask, now and then, "What does my trade association dollar pay for?" And he has a right to an answer. He has an equal right to refuse to supply more dollars, if he so desires.

Too often it is forgotten that a trade association, and the electrical association is not to be excepted, is merely a business concern in another form. Like other business concerns it can succeed or fail. And specific reasons can be assigned for success or failure. Often, too, it happens that member concerns which are financially successful are not awake to the actual failure of an association to which they belong, actual failure despite its ability to "carry on" after a fashion.

If business executives themselves took the time to study out the causes of trade association failures and to weed out the causes of failure in their own associations, the waste of money in trade association work would be cut down by untold thousands of dollars annually. As it is, despite their membership, too many executives let their association run as a failure long before its actual condition is discovered and remedied, if at all.

One outstanding reason for success in trade association work may, therefore, deserve the editorial spotlight for a moment.

An examination of trade association records shows, other things being equal, that that trade association succeeds best which furnishes practical working data on production, finance, marketing, merchandising, advertising, sales, and general business control, and when it provides specialists who can interpret the data in such a way as to give each member a true picture of the tendencies in the whole trade and his relation to them.

That reason seems almost obvious. And yet trade association history is full of instances showing how associations have failed to do the practical thing, how they have worked along obstructive rather than constructive lines. When a trade association, national, sectional, or local, acquires a reputation for combativeness rather than constructive achievement, it is high time for the membership to effect a thorough housecleaning in the administrative office of that association. Likewise, the drawing up of codes of ethics with the expectation that on their adoption members will display and observe them, is not enough. Practical ways to make such codes effective have been found by associations that have succeeded.

Many reasons can be given for success and failure in trade association work. Electric manufacturers might, perchance, find it profitable to give more thought to all of them. The industry's investment in trade association work deserves the strongest protection that can be thrown around it.

How Do You Determine Motor Ratings?

MOST machine tools and mechanical devices at the present time are either provided with motor drive by the manufacturer or arranged so that the customer can easily apply a motor himself. In those cases where the machine requires a motor of small rating, a standard design is used and price often figures to a considerable extent in the selection when the number sold runs into a large annual total. No manufacturer can in all ways govern the application of a standard machine, select the skill advisable for its installation or its location, hence many misfits crop up to give annoyance to the builder in service and operating troubles that might be avoided. Frequently in this connection the maker of the machine is blamed for operating difficulties that are beyond his control and the reputation of his product suffers from impressions and experiences of the purchaser that have no fundamental bearing on the design of the machine or the work that it is capable of doing when properly used.

Owing to this fact, many manufacturers have a tendency to offer their machines without motors and allow the user to buy the motor and thus assume the responsibility for its application and installation. Even this does not cure the situation.

In general alternating current motors used on machines are either too large or too small when troubles are experienced and the motor is selected from the maximum brake horsepower test on the machine itself. When too large the customer pays for poor efficiency and low power factor in his power bills and when too small he likewise pays in excessive maintenance and interruptions in service through burnouts or trouble from hot bearings.

Much of this difficulty in the selection of motor ratings is due to placing too much dependence on ratings expressed in horsepower. For some years the American Institute of Electrical Engineers has favored the rating of motors in kilowatts available at the shaft and it is to be hoped that this may be brought about sooner or later. In such a case it would be a simple matter for a machine builder to use a graphic wattmeter in its final inspection and test on a motor driven machine and submit to the purchaser a graphic chart showing the exact amount of power required and what might be expected in variations from normal under different operating conditions. Such a graphic chart would provide an understandable record of limitation due to overload that could not be disputed in cases of trouble. Such a record when shipped with a machine would also aid the that he can make with a graphic wattmeter at any time purchaser for it furnishes the basis for a similar check during the life of the machine.

Some manufacturers do use this method of check on motors used but very few make such information available to the purchaser. We strongly recommend that this procedure be considered by makers of washing machines, electric operated refrigerators, small pumps, fans, air compressors and the like as well as machine tools. At least it would help the purchaser to use machines within their motor rating limitations or provide corrections before the machine is actually put into service. It would also prevent much expense from trouble calls if such

information were available from service branches or if installation instruction sheets would indicate that it is available on request.

Loose Talk on Price Fixing

THE current rumor among the purchasers of electrical products to the effect that there is a growing amount of price fixing among electrical manufacturers indicates a lack of appreciation of the changes that are taking place in the industry.

Price fixing is not only illegal but it is impracticable. What the purchasing agents are mistaking for price fixing is little more than a stiffening of the backbone of the manufacturers themselves. More and more it becomes evident that the electrical manufacturers are learning just what their actual costs are. They are demanding a profit and refusing to take business at a loss. In other words, now that they know their costs as they never did before, they have acquired a larger measure of courage to stand up for a fair profit. It is perhaps unfortunate that purchasing agents accuse the manufacturers of fixing prices, but as a matter of fact buyers are satisfied if they are sure that they are paying about the same price that other manufacturers are asking. With a better knowledge of actual costs and methods of cost control spreading among the manufacturers, it should be evident that any wide spread in price for the same quality and quantity is just as illogical as trying to make prices high by agreement.

Thus far the electrical manufacturers have only made a start, and a rather poor start, at the stabilization of their business, but if each group establishes a uniform method of cost accounting and if every manufacturer insists on a fair profit with every order, then the electrical manufacturing industry may be able to emulate the bolt, nut and rivet manufacturers. With an annual business of $75,000,000 they changed a $12,000,000 loss to a $6,000,000 profit in about two years. Stabilization of business seems possible under the law.

The Illusive Item of Overhead Expense

THE pricing of a new product is known to be one of the most treacherous and vexing of problems facing a manufacturer. If the price is too low the older competitor begins to sharpen his pencil and figure costs toward a reduction in his selling price, with the result that the margin of profit to all concerned is too small unless a large volume of sales is possible. If the price is too high from a competitive standpoint, the sales expense in getting the required output is excessive bringing about the same result as when the selling price is set too low.

All costs of every product made and sold must be charged into material-labor and overhead after the required capital setup has been provided for the necessary equipment. It is usually an easy matter to distribute costs properly under the headings of material and labor but not so easy to determine for any long period how much can or should be carried as overhead for a new machine unless a good sized accounting sponge has been provided to absorb such items as slips of judgment and unforseen conditions.

Overhead is usually considered to include those expenses of a business which cannot be directly traced to the actual manufacturing processes. It has the unfortunate characteristic of being largely a fixed item and does not decrease in proportion to reductions that may take place in output or sales. Likewise it does not increase in proportion to increases in production so that unit costs of overhead are troublesome when output is curtailed. It is the usual practice to base the practical limit of the overhead charges in a manufacturing operation on normal production so that when production is above normal a reserve can be set up to provide for those times when production is light. In any case it is important that overhead expenses should be known and separately compiled for a new product over relatively short periods and charged against production departments that can equitably absorb them.

It is not the intention to set up here a definite formula for the handling of overhead expenses under all conditions, but what has been said leads up to a suggestion regarding an increase in overhead through the substitution of machines for hand labor in an attempt to reduce production costs. Every time this is done the overhead expense will increase while the total production costs may be materially decreased. This is a point often overlooked. In order to proceed on a safe basis, it is good business to buy all the labor-saving equipment your normal output will keep busy 80 per cent of the time so long as the yearly savings in labor, in fixed charges on labor and in earnings from increased production will cover interest on the machine investment, insurance, taxes, depreciation, upkeep on the added equipment and the increase in the cost of power and enable you to pay for the machine in five years and earn at least 6 per cent on the added investment.

When you can do this, automatic equipment will take care of its own overhead expenses and enable other necessary increases in overhead to be absorbed on the basis of normal production without seriously cutting into surplus or demanding the laying off of salesmen at times when sales are thin and sales activity should be accelerated instead of curtailed.

The Opportunity Offered Electrical Manufacturers by the Parts Maker

ALMOST every electrical appliance or machine in use today is so designed and constructed that there are parts in it which are made on specialized machines, making a number of products, all different but requiring similar operations in their making. And when the electrical manufacturer has finished the design of his appliance there remains the big engineering problem of how to produce it, which must be solved satisfactorily if he is to market it at a profit.

The trend in manufacturing which has led to the formation of companies specializing in the making of parts of all kinds offers the electrical manufacturer two alternatives in the making of his product. He can either install his own equipment or he can let the parts specialist make the parts he requires. The decision in this problem is purely an engineering one, the balancing of the cost of making the parts himself and the cost which the specialist can quote, but there are a number of things to be considered in analyzing this problem. The parts specialist is not depending for his profits upon the requirements of one manufacturer alone, but is making millions of parts for a number of manufacturers. Naturally, this quantity production determines the type of equipment he can afford to install, the accuracy of parts he can obtain and the delivery dates he can guarantee. In addition, the parts specialist is in a position to study the raw materials market, buy in large quantities at the right time and at a favorable price, and therefore, give his electrical manufacturer customers the benefit by quoting a lower price on parts.

Furthermore, the electrical manufacturer must decide whether he can devote the time to this field of work, which will be required if he is to keep informed and be able to take advantage of the new developments.

Nema Radio Division Studies Problems of Distribution

Chicago meeting includes discussions of means by which radio merchandising may be improved

MANY problems confronting the radio industry were discussed by the radio division of the National Electrical Manufacturers Association at its meeting at the Drake Hotel, Chicago, June 4-7. The various sessions of the merchandising council indicated an increasing desire on the part of radio manufacturers to solve the problems of distribution in a wise and practical manner. Some of the outstanding features of the meeting at Chicago were:

Merchandising instruction for dealers—A complete course is being prepared by the radio division in collaboration with the Radio Institute of America. This course will be designed to make the dealer a more efficient radio service man. "It is only reasonable to assume," said R. I. Duncan, director of the institute, "that the public has become educated to the point that it is going to purchase radio equipment from the dealer who can and will render service." One text book in this course will teach the dealer the principles of radio from the angle of broadcast reception; the other textbook will give him the wiring diagrams of standard receiving equipment and power devices now in use.

Price cutting—Representative Clyde Kelly of Pennsylvania, co-sponsor of the Capper-Kelly fair trade bill, designed to permit the manufacturer of an identified product to contract as to its resale price, denounced "the predatory price cutter of standard guaranteed merchandise" as one of the greatest enemies of the public and manufacturer alike. He regarded the radio business as especially vulnerable to price cutting. "When 'gyp' merchandise," he said, "is substituted by predatory price cutters, the public suffers. Cut-throat competition drives the independent out of business. Consolidations follow and the cycle is compiete."

Trade-ins—That the radio industry is approaching the day when trade-ins of receiving sets will be on a basis comparable to the trade-in situation in the automobile industry was indicated by H. Curtiss Abbott, general sales manager, Crosley Radio Corporation. With the wide acceptance of self-contained all electric receivers, Mr. Abbott believed a standardization of trade-in values should be arranged. Dealers would be prone to make allowances only on the battery-operated set, neglecting the accessories, and an allowance not sufficient to make a clear profit on the new set possible. Any attempt to place a valuation on a battery-operated set should be based on the receiver and not its accessories. This would mean a much lower trade-in valuation this season. Next season the allowance might be higher.

Louis B. F. Raycroft, head of the radio division, announced that within a few months the Nema Handbook of Radio Trade-in Values would be published for the use of all dealers throughout the country.

Installment sales—The following plan was recommended by H. B. Lewis, vice-president, Commercial Credit Company, for adoption by radio manufacturers: down payment 25 per cent; payment of balance in 12 months, with ten months preferred, and divided into equal, non-interest bearing monthly installments; paper to bear dealer's full indorsement; factory repurchase agreement to give the plan widest effect at lowest practicable rate; payment of 90 per cent of the face of the note to the dealer at date of purchase, the remaining 10 per cent to be paid him also immediately upon liquidation of the transaction; collections to be made by the finance company rather than by the dealer; fire and theft protection for the buyer and conversion protection for the dealer, if desired, at a slightly higher than standard rate.

Statistics—The statistical division has completed a statistical study of the radio market throughout the country, a study hailed by the manufacturers at the meeting as one of the most important group actions ever taken by the industry.

Premature publicity—"Responsible radio manufacturers," said Alfred N. Goldsmith, speaking for the Institute of Radio Engineers, "have consistently avoided disclosures of supposedly marvelous but actually unproved developments in the radio field. They have shown by the truthful and conservative character of their publications descriptive of new equipment or methods that they appreciate the injurious effect upon public confidence of premature and exaggerated descriptions of trivial or inconsequential modifications of existing methods or equipment."

Broadcasting—"Radio through the appointment of the Federal Radio Commission is now flatly in political control," said Mr. Raycroft. "Although the commission can do no more than carry out the law, I have more faith in the proper regulation of radio by the commission as an appellate body and the direct control of broadcasting and other aspects of the art by the Department of Commerce." He believed the Radio Act of 1927 providing for equal allocation of wavelengths and power would have a serious bearing on radio apparatus sales. The broadcast transmitter section went on record as opposing the granting of licenses to stations used "purely as house organs for selling merchandise of one firm" and as favoring those stations which serve a wide variety of interests. Nema also favors the early adoption of the engineers' plan of broadcasting allocation to provide the best radio conditions for listeners.

Television—Dr. Herbert E. Ives, television research engineer, Bell Telephone Laboratories, asked: "What will the public be willing to pay when they find out what the quality of pictures obtainable even with our present day comparatively crude apparatus is?

The meeting of the radio division also discussed cooperative credit service, Federick P. Vose of the National Electrical Credit Association explaining the activities and methods of that organization; and the work carried on by the 4500 members of the Institute of Radio Engineers as encouraging the progress of radio engineering.

Electrical Manufacturing, July, 1928

Characteristics That Determine the *Selection* of MOTORS

No. 2 of a Series Discussing Motors of Different Types

The synchronous motor, formerly used only as a condenser, is now being applied on a large number of installations and machines

BY THEODORE SCHOU AND C. P. ROBINSON
Chief Engineer *Designing Engineer*
Ideal Electric & Manufacturing Company

CHARACTERISTIC curves of synchronous motors of different types and some applications of these motors were discussed in article No. 1, published in the June issue of ELECTRICAL MANUFACTURING. In this article other types of motors are discussed and installations illustrated. The discussion of synchronous motors will be concluded in article No. 3 to be published in the August issue. Further applications will be explained and illustrated and the necessary control apparatus will be described.

Classification of Present-Day Types of Synchronous Motors

Rotating field—definite or salient pole construction. Under this heading we have the bulk of standard synchronous motors built in different types to suit various applications.

Two-bearing bracket type. Fig. 11 shows a typical bracket type synchronous motor with direct connected exciter and arranged for belt drive. Fig. 12 shows typical high speed (1800 r.p.m., 60 cycles) rotor construction. Fig 13 shows an installation of bracket type synchronous motors coupled to centrifugal pumps. Belted machines of this type are built at 60 cycles for speeds ranging from 327 r.p.m. to 1800 r.p.m. and in capacities (limited by belt pull on bearing) from 30 hp. to 200 hp. Coupled they are built for the same speed range up to 750 hp. capacity. The starting characteristics vary, inherently, somewhat with the speed, and, although they may be varied over a wide range to meet the special requirements, standard recommendations for 60 cycle motors will be found to be approximately as given in Table 1.

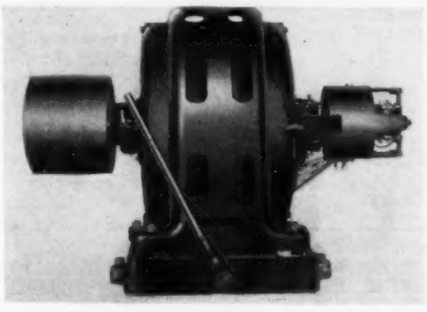


Figure 11—A two-bearing bracket type synchronous motor with direct connected exciter and arranged for belt drive

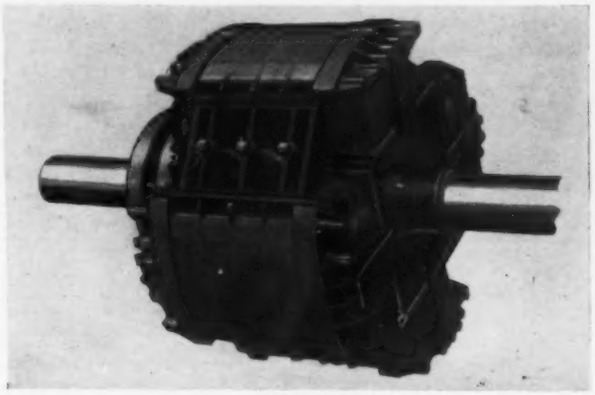


Figure 12—Typical rotor construction for a synchronous motor designed for 1800 r.p.m., 60 cycle operation

Some well established applications for this type are:
Part of motor-generator sets.
Air and ammonia compressors.
Centrifugal and rotary pumps.
Jordans.

TABLE 1. 60 CYCLE—STARTING CHARACTERISTICS

R. P. M.	In Per Cent of Normal			At Normal Voltage		
	Volts	Starting		Per Cent Pull-in		Pull-out
		Torque	Kv-a.	Torque	Kv-a.	Torque
450 to 720	80	60	300	75	250	175
900 to 1200	70	65	300	100	300	175
1800	60	25	225	110	350	175

Driving fans, blowers, conveyors and line shafts.

Two-bearing pedestal type. This type of construction has not the compactness and space saving feature of the bracket type, but it provides for side movement of the stator and adapts itself readily for a multitude of larger, slow speed ratings, being a commercial, flexible combination of an engine type motor furnished with base, shaft and bearings.

Typical stator and rotor constructions are shown in

Figs. 14 and 20. Fig. 16 shows this type of motor complete and coupled to a steel rolling-mill load. Just recently, the application of synchronous motors to such loads was found to be very satisfactory. Ruggedness and high pull-out torque are essential features in connection with such drive, the load curve of which is reproduced in Fig.

Figure 13—An installation of six bracket type synchronous motors direct connected to centrifugal pumps

15. Sixty cycle synchronous motors of this type are built in speeds from 72 to 1800 r.p.m., and in capacities from 50 up to 3000 horsepower. Standard recommendations as to starting characteristics for 60 cycle motors of this type will be found to be approximately as given in Table 2,

TABLE 2. 60 CYCLE—STARTING CHARACTERISTICS

R. P. M.	In Per Cent of Normal			At Normal Voltage		
	Volts	Starting		Pull-in		Pull-out
		Torque	Kv-a.	Torque	Kv-a.	Torque
72 to 200	100	40	265	40	200	150
225 to 300	100	45	300	45	225	150
327 to 514	80	60	300	75	250	175
600 to 900	70	55	300	100	300	175
1200	70	65	300	100	300	175

but it should be understood that variations in starting characteristics over a wide range can be effected to meet with special requirements.

Some established applications for this type are:

Rock and ore crushers.
Tube mills.
Rolling mills.
Cement mills.
Rubber mills.
Flour mills.
Pulp grinders.

Fig. 21 shows installation of large synchronous motor driving a pulp grinder.

Three-bearing pedestal type. Frequently, as an additional factor of safety, this type of construction is favored in ratings which normally would call for a two-bearing bracket or pedestal type. Mainly, however, it adapts itself to belt loads, which would be too severe for the two-bearing type. Motors of this type may be built using a bracket type with base and outboard bearing and shaft size accordingly, Fig. 23, or side movement of the stator is provided by using an engine type stator mounted on base with three bearings, Fig. 17. The middle bearing is usually somewhat larger than the others. Such motors are used for heavy loads for either belt or rope drive and for 60 cycles are built in capacities and speeds from 150 to 750 hp., 300 to 720 r.p.m. Sixty cycle starting characteristics will be found to have recommendations as shown in Table 3.

TABLE 3. 60 CYCLE—STARTING CHARACTERISTICS

R. P. M.	In Per Cent of Normal			At Normal Voltage		
	Volts	Starting		Pull-in		Pull-out
		Torque	Kv-a.	Torque	Kv-a.	Torque
300 to 400	100	40	300	40	225	150
450 to 720	70	45	250	70	300	175

Some well established applications for this type of motor are:

Air and ammonia compressors.
Rock and ore crushers.
Saw mills.
Cement mills.
Conveyors and line shafts.

Engine type. Under this heading comes the slow speed,

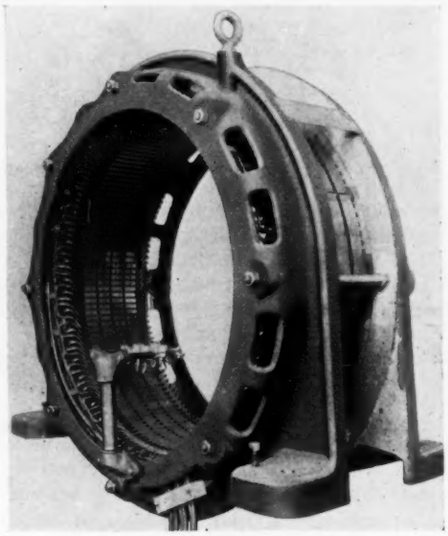


Figure 14—This illustration shows the typical stator construction for the two bearing pedestal type synchronous motor

direct connected synchronous motor, called engine type because it is designed to drive reciprocating engines like air, ammonia, carbon dioxide compressors and the like. This has been and is indeed a fertile field for synchronous motor application. Where constant speed, direct drive is desired, the slow speed synchronous motor always demands and receives due and careful consideration. This is due to the excellent operating characteristics of such motors. The engine type synchronous motor for direct connection

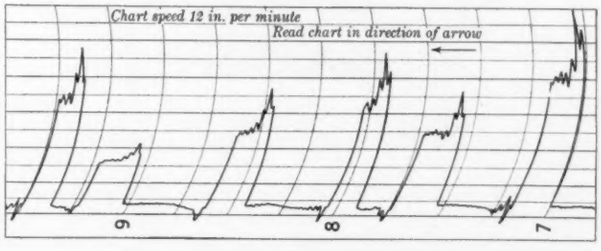


Figure 15—Load Chart of an 800 hp. motor direct connected to steel tube rolling mill. Mill speed is 109 r.p.m.

to compressors is usually furnished without shaft and bearings. The stator is mounted on sole plates which provide for side movement and the rotor is mounted on compressor shaft, either between the two bearings as with duplex compressors, Fig. 22, or mounted on free shaft

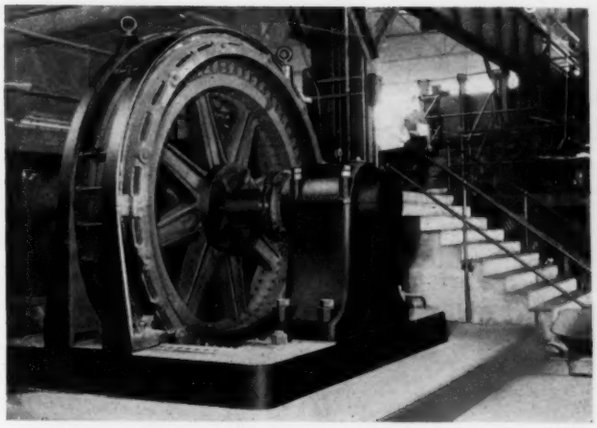


Figure 16—A two bearing bracket type synchronous motor direct connected to a steel rolling mill load

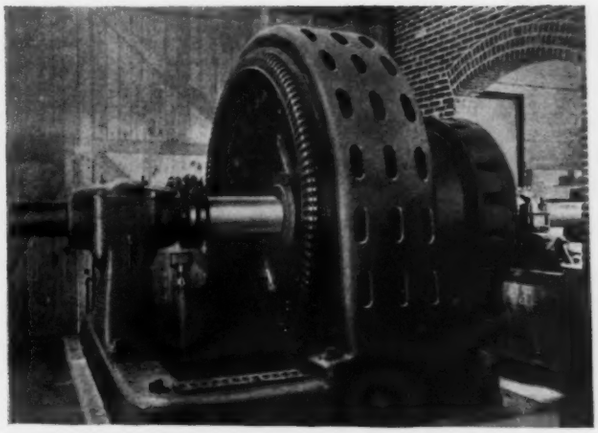


Figure 21—A 2800 hp., 225 r.p.m., 2300 volt, unity power factor motor driving three four pocket pulp grinders

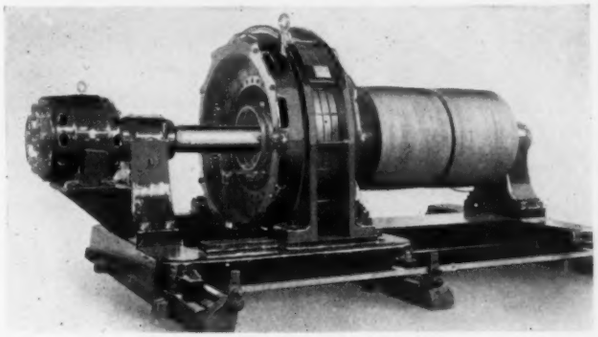


Figure 17—Side movement of the stator is sometimes provided by using an engine type stator on a base with three bearings

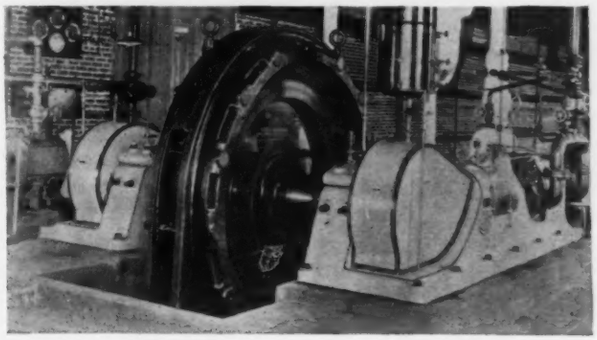


Figure 22—Synchronous motor with rotor mounted on the shaft connecting two large size duplex compressors

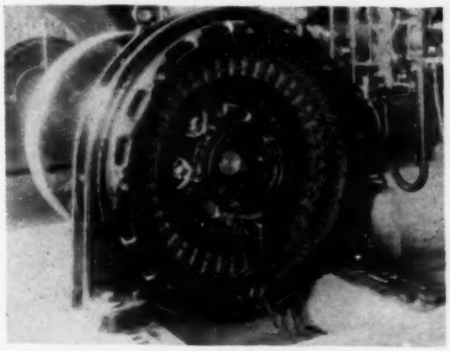


Figure 18—Engine type motor with rotor on free shaft extension for driving smaller horizontal or vertical compressors

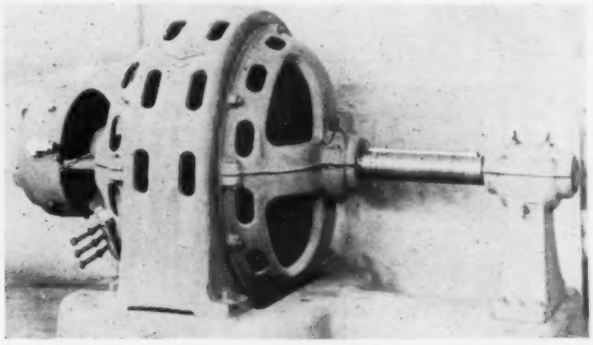


Figure 23—This type of motor is particularly suited to belt drive with the pulley inside of the outboard bearing and long shaft

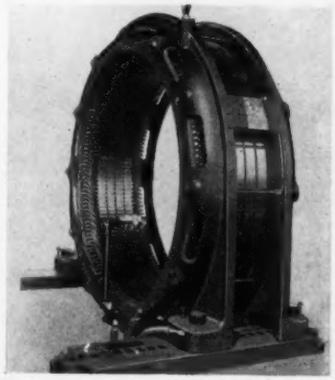


Figure 19—Typical stator construction to supply flywheel effect

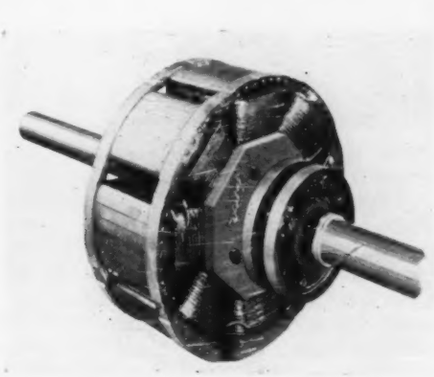


Figure 20—Typical rotor construction for the two bearing pedestal type motor

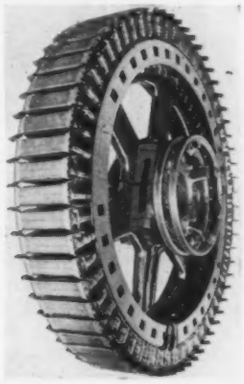


Figure 24—Normal flywheel effect rotor

extension in case of smaller horizontal or vertical type compressors, as shown in Fig. 18.

In connection with synchronous motor driven compressors, the question of proper, incorporated flywheel effect to insure stability and limit the current pulsation to

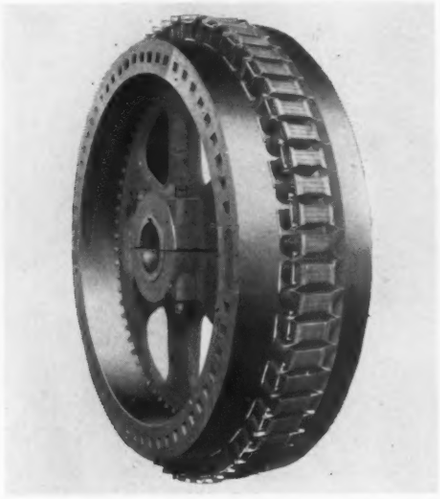


Figure 25—Typical rotor construction which provides the maximum flywheel effect as required for compressor drive

a reasonable value caused no little anxiety in the early days of such synchronous motor applications. At present, however, this problem is settled and synchronous motor manufacturers now give standard recommendations for proper and necessary flywheel effect in connection with the different types of compressors. Fig. 19 shows typical stator construction of this type and Figs. 24 and 25 rotor constructions with normal and maximum flywheel effect incorporated in the rotor proper. Both these rotors are of the split construction for mounting on duplex type of compressor. Fig. 26 shows an installation of large engine type synchronous motors driving duplex carbon dioxide

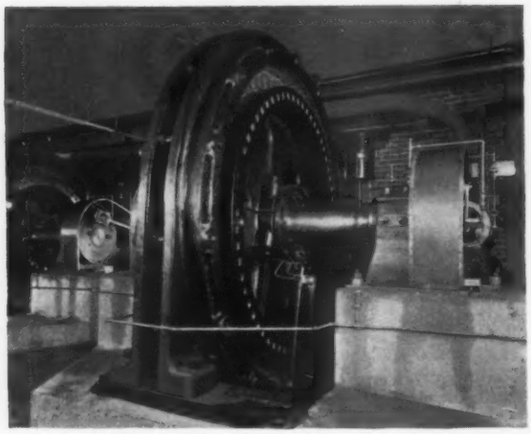


Figure 26—An installation of large engine type synchronous motors driving duplex carbon dioxide compressors

compressors. As many such installations go into theaters and residence districts, the question of noiseless motors is often given paramount consideration. Up to date, slow speed, synchronous motors are usually very quiet and also in this respect adapt themselves splendidly to such drives.

In order to commercialize the small and moderate capacity, slow speed synchronous motor, and also to increase the inherent flywheel effect of the rotor, an engine type synchronous motor, termed the flywheel type, has been developed and standardized by the Ideal Electric & Manufacturing Company. These motors have the rotating field outside the stator, thus increasing the radius of gyration of the rotating mass to such an extent that, for the same rating, the flywheel type synchronous motor has approximately three times the flywheel effect of the conventional engine type. As this feature reflects economy as to first cost, this type of motor has become very popular where space is limited (like in old theater buildings) and heavy

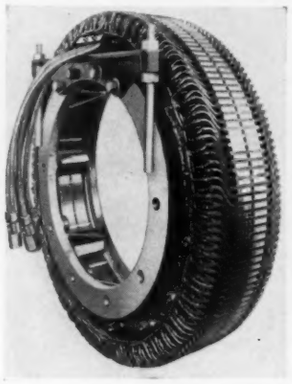


Figure 27

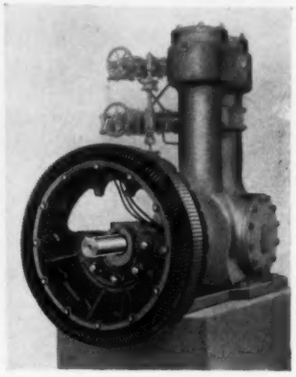


Figure 28

Figure 27—Flywheel type stator construction arranged for mounting on compressor frame as shown in Figure 28

flywheel effect required (as with carbon dioxide compressors). Fig. 27 shows the flywheel type stator construction arranged for mounting either on compressor frame, Fig. 28, or outboard bearing, Fig. 29, or on auxiliary support, Fig. 30. Fig. 31 shows flywheel type rotor construction, which may be of the solid or split construction, depending upon the application. Fig. 32 shows an installation of this type.

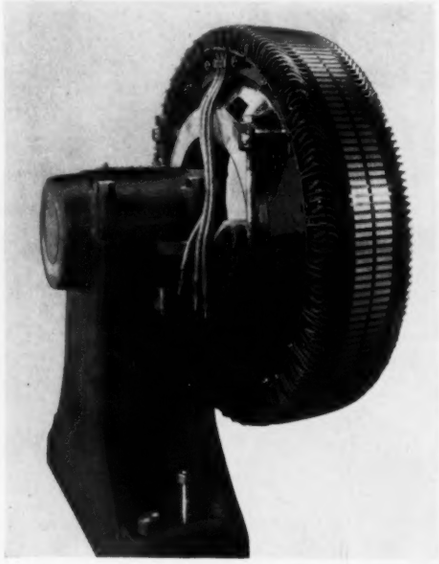


Figure 29—The same type of stator as that shown in Figure 27 mounted on an outboard bearing pedestal

Starting characteristics. Standard 60 cycle starting characteristics as given in Table 4 will be found to be satisfactory for ordinary compressors furnished with full size by-pass for starting, and it should be noted that for this type of synchronous motors the inrush from line at full voltage is low enough to use full voltage (or across the line) starting equipment, which feature, discussed

under Control, permits the use of simple and inexpensive control equipment.

The conventional engine type synchronous motor is built

Figure 30

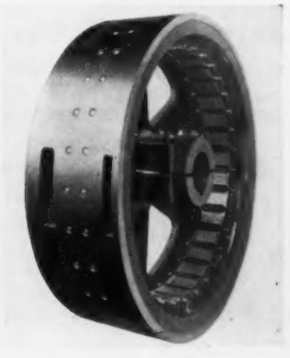


Figure 31

Figure 30—The flywheel type stator may also be mounted on an auxiliary support as shown here

Figure 31—This type of rotating field is used with the stators as shown in Figures 27, 28, 29 and 30

in sizes ranging from 30 to 2000 hp. and speeds from 60 to 400 r.p.m. The flywheel type from 10 to 400 hp. and from 116 to 450 r.p.m. The engine type synchronous motor predominates in the field of application for slow, constant speed motors direct connected to reciprocating machinery.

The vertical type. Vertical synchronous motors have found a great field of application for driving deep well pumps. An interesting application has been engineered

TABLE 4. 60 CYCLE—STARTING CHARACTERISTICS

R. P. M.	In Per Cent of Normal			At Normal Voltage		
	Volts	Starting		Pull-in		Pull-out
		Torque	Kv-a.	Torque	Kv-a.	Torque
72 to 240	100	40	265	40	200	150
257 to 400	100	45	300	45	225	150

by the Electric Machinery & Mfg. Company in applying this type to Buhr Mill drive. See Fig. 33. The thrust bearing supporting the entire weight of rotating parts is located in the motor base. The unit is built especially low

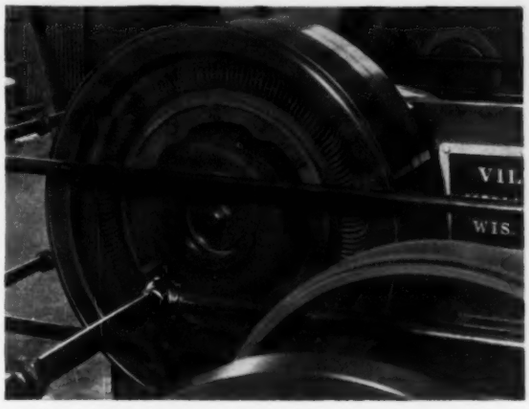


Figure 32—An installation of the outside rotating field type motors. The rotor is solid or split as required

to permit feeding the raw material into the top from existing conveyor trunks. Furnished with anti-friction bearings, the starting characteristics, as far as torque is concerned, are somewhat better than those given for the horizontal, two-bearing pedestal type.

The super-synchronous motor. This interesting type of synchronous motor has been developed by the General Electric Company and although of rather recent origin, it has well established itself as a special type for special applications. The super-synchronous motor is a synchronous motor so constructed mechanically that its pullout torque is also its starting and pull-in torque. In electrical construction and essential overall dimensions, it is identical

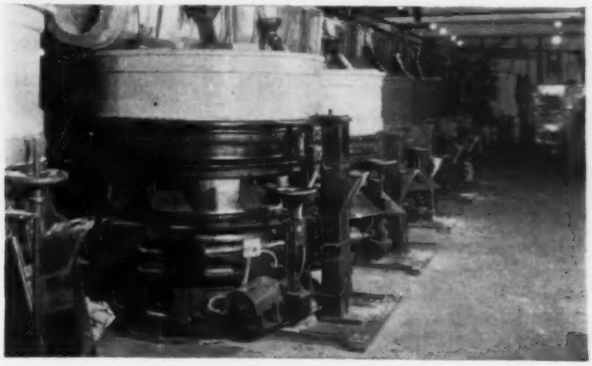


Figure 33—Vertical synchronous motors applied to Buhr mill drive. These motors are also used on deep well pumps

with the conventional type. Mechanically, however, the stator of this type is suspended in auxiliary bearings allowing it to rotate during the starting period and attain synchronous speed with excitation applied. Manipulating a mechanical brake brings the stator to rest, at the same time accelerating the rotor field with its connected load.

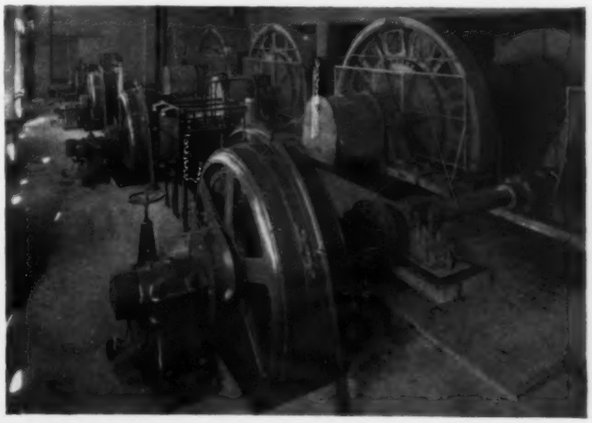


Figure 34—An installation of 800 hp., 2200 volt, 25 cycle, super-synchronous motors driving raw grinders in a cement plant

When the armature becomes stationary, the brake is locked, and the unit continues to operate as a normal synchronous motor.

This type of motor has found well established applications for loads which are difficult to start and pull-in without using a magnetic clutch arrangement in connection with the conventional type, such as pumps where by-pass connections are omitted and air compressors where unloading valves are omitted—also, where machines are called upon to start up loaded with material, as in the case of cement mills, rubber mills and stone crushing plants. The super-synchronous motor is now available in a great variety of ratings and speeds. Naturally the cost of this type is greater than that of the conventional type, but, as it is space saving and auxiliary equipment such as clutches are omitted, it has a good commercial feature. Fig. 34 shows a typical installation using super-synchronous motor drive.

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

Industry Sales Conference Undertakes Market Study and Development of Industry Selling Plan

In developing a selling program for all branches of the industry, the Electrical Industry Sales Conference, through its Sales Plan Committee, has engaged marketing counsel to undertake immediately a research study into all consumer and industry factors governing the market for adequate wiring in the home. Out of the facts obtained will be built the cooperative selling plan for early announcement to the industry.

The Sales Plan Committee investigated the field of research and advertising and selected the J. Walter Thompson Company, of New York, Chicago, Boston, Cincinnati and San Francisco.

J. E. Davidson, chairman; G. E. Cullinan, vice-chairman; W. E. Sprackling, L. W. Davis, J. E. North and J. L. Ray comprise the Sales Plan Committee, which is also to function as the contact committee between the industry and the J. Walter Thompson Company in developing the selling plan.

The Electrical Industry Sales Conference, appointed for the purpose of considering and developing a national sales program for the industry, adopted at its first meeting this resolution:

> "That the Industry Sales Conference make as its first objective the development of a broad industry program for the promotion of more adequate house wiring through an organized national movement to rewire the houses now connected to the power systems of America where the installations provide inadequate facilities for the use of complete electrical equipment and also to establish a higher standard of adequacy for the purpose of wiring new houses.
>
> "That the conference recognizes that the present status of the electrical house wiring contractor will prove a fundamental factor in the carrying out of any program to promote house wiring and that careful study should be given to this problem in the hope that a way may be found to increase his effectiveness as a creative influence in the development of the electrical market."

The problem of increasing the effectiveness of the house wiring contractor is being considered as the subject of a special program for industry action and is not within the scope of the work assigned to the agency, although the house wiring contractor will be one of the elements to be considered in developing the main selling plan.

The scope of the work for which the agency has been engaged is stated as follows:

1. "Approaching the problem with the attitude of fundamental analysis, the necessary investigation is to be made which will provide a clear understanding of the market to be influenced, geographically and psychologically, with regard to this problem, as a basis of definite knowledge on which to proceed. This investigation will refer to the present objectives of the conference, as distinguished from a broader investigation of the whole marketing situation of the industry.
2. "Interpret the findings of this investigation in the light of broad merchandising experience and from an outside viewpoint.
3. "Prepare a comprehensive all-industry selling program founded on the conclusions reached, and comprised of two parts, viz.:
   a. A complete and self-contained localized selling plan, suited to successful promotion and operation in any community. This would be designed as a local cooperative plan, with participation by the electric utility, wholesaler, contractor, dealer and manufacturer's representatives.
   b. A national phase to give a national background of advertising and publicity, and to provide the bond for tying the local programs into a national movement.

   "It is expected that the program will be built around a new and effective approach that will grip the imagination of the public.
4. "Develop an effective plan for presenting the main selling program to the electrical industry in a way to secure the necessary financial support and participation throughout the country. The industry's existing national and local facilities would, of course, be counted on to perform their proper functions."

Funds for the preliminary investigation and development of plan have been made available by the national associations. The conference is handling the business arrangements through the board of directors of The Society for Electrical Development, and members of the staff are assisting the Sales Plan Committee and the agency.

Allen Electric Takes Over General Equipment Corp.

General Equipment Corp., Kalamazoo, Mich., has merged with Allen Electric Manufacturing Company, Detroit, forming the Allen Electric & Equipment Company. G. H. Allen is president of the company, which will be located at Kalamazoo.

American Exporters Benefit from British Development

American manufacturers of electrical apparatus will benefit by the program of power development provided for by recent legislation in Great Britain, according to Assistant Commercial Attaché Hugh D. Butler, London. The market for electrical apparatus is certain to receive a marked impetus when the newly planned superpower system begins to function in Great Britain, Mr. Butler says.

The new British law contemplates the linking of numerous generating stations heretofore unstandardized and uncontrolled, forming a huge electrical system which will provide current to both industry and the home at greatly reduced rates. Mr. Butler believes that American manufacturers are prominent in handling expensive high-class electrical goods, and that future expansion of our electrical trade with Great Britain will occur in this field. However, he expects the introduction of new American lines to be followed by strenuous domestic competition.

Sales of American electrical goods in Great Britain in 1927 were valued at approximately $6,000,000. Included in this figure were household motors valued at $800,000; heating apparatus, $200,000; refrigerators, $412,000; and washing machines $122,000.

The capital invested in the entire electrical industry of Great Britain, including station equipment, amounts to approximately $4,000,000,000, of which $375,000,000 represents investments in the manufacture of various electrical products. There has been a steady increase in British electrical companies and undertakings during recent years, the number rising from 1400 in 1913 to 1700 at the beginning of 1928.

"Mechanical Man" Talks in New Experiment

The "Televox" or "Mechanical Man," developed by R. J. Wensley, switchboard engineer of Westinghouse Electric & Manufacturing Company, has been given a voice. In order to make the equipment more suitable for use over the public telephone system, the Televox can produce a vocal response in the English language or any other language desired.

Previous models of Mr. Wensley's invention were not able to originate a call should something unusual happen in the substation. With the new model, however, should a circuit breaker trip automatically, or a machine overheat, or any of the various protective devices fail to function, the machine is automatically started and the voice of the mechanism speaks to the telephone operator, giving her the number

of the dispatcher's telephone—thus putting through a call in the usual manner.

To give the mechanism means for emitting articulate speech of good quality, use is made of developments in the "talking movie" industry.

Standards Committee Enlarged for National Federation

The American Engineering Standards Committee is being reconstructed to effect a definite federation of national organizations under the name American Standards Association. It is hoped that trade associations interested in standardization may more readily join in the direction of the movement, as a result of the reconstruction. Other aims of the plan are to place the technical work of approving standards in a Standards Council, and to concentrate administrative and financial responsibility in a board of directors composed of twelve industrial executives.

Reorganization has been unanimously approved by the main committee of the American Engineering Standards Committee, and is now being voted on by member-bodies The action of the committee is the result of more than a year's intensive consideration of the subject by the main and rules committees. The latter was enlarged to include a representative of each of the 19 member-bodies desiring representation.

Growth of the trade association movement together with the predominating position which the trade association is coming to have in the field of industrial standardization was one of the conditions leading to the reorganization The increasingly important direct part which the plant executive is playing in the standardization activities within his plant and in the movement as a whole also gave rise to the new plan. Recognition of this latter condition is reflected in the make-up of the board of directors, which will control the general administrative and financial affairs of the association. The industrial executives composing this board will be elected on nomination of member-bodies, and will serve for three years.

"The ten years' experience of the committee has brought to light certain fundamental difficulties inherent in the old organization," said William J. Serrill, chairman, in submitting the plan for approval of member-bodies. "It is the purpose of the reorganization to eliminate these difficulties."

Oil Heater Installations Stressed in Booklet

The Oil Heating Institute of New York, composed of leaders in oil burner manufacturing and major oil companies, has issued a booklet designed primarily for the information of architects, but also interesting to others in the oil heating field.

It emphasizes the need of correct installations, asserting that "as much attention should be paid to this one factor as to any other, for upon it depends the successful operation of the equipment." It prescribes maintenance of equipment by service men as the only way to obtain good results. The booklet contains a discussion of the principles of combustion.

Nema Recommends New Power Rating for Broadcasters

The transmitter section of the National Electrical Manufacturers Association radio division has recommended that radio broadcasting stations be classified as to power so that the smallest power possible to give good service shall be not less than one-half kilowatts, and that stations designed for greater service shall be allotted five, fifty, and five hundred kilowatts, depending on size.

It is understood that the new recommendations advise the relative increase of power in all stations, officials believing that the large and small station will be enabled to render better service as the general level of power is revised upward.

Monowatt Corporation Names New Vice-Presidents

S. C. Caswell, formerly manager of the New York office of General Electric Company, and A. W. Warren, of the Miller Company, Meriden, Conn., have been elected vice-presidents of the Monowatt Corporation, 546 Broadway, New York City.

S. C. Caswell

Mr. Caswell was with the National Lamp Works of General Electric Company for twelve years. He will be vice-president in charge of sales at the Monowatt headquarters in New York City. Mr. Warren, for fifteen years with the Miller Company and formerly western sales manager, will be commercial vice-president of Monowatt with offices in Chicago.

A. F. Warren

Both men are well suited for their new offices, Mr. Caswell having been engaged in New York and vicinity during practically all of his previous experience, and Mr. Warren being unusually well acquainted with Chicago because of his former position with the Miller Company.

National Exposition of Power Planned for December

The seventh National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York City, Dec. 3 to 8, during the annual conventions of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers.

Visitors to the show during the last eight years have increased from a few hundred yearly to a registered visitors' list of 25,000 last year, and, in view of the renewals by exhibitors for 1928, the four floors of Grand Central Palace will again be taxed.

Several universities throughout the country have included a tour of the exposition in their courses and are allowing credit to students attending.

Reichmann Joins Joy-Kelsey for Radio Production

Frank Reichmann, pioneer manufacturer of radios, has joined Joy-Kelsey Company, Chicago, who will make, under his direction, a complete line of speakers, dynamic and magnetic cones, and radio chassis of seven and eight tubes, including the shielded grid type. Mr. Reichmann is retaining the engineers of his former organization who will aid him in carrying out an extensive research program with Joy-Kelsey. He will be associated with G. A. Joy, Roy Augustine and W. R. Brown.

Frank Reichmann

A. H. Grebe Sponsors Essay Contest for Scholarships

Two radio scholarships, to be given each year by the Veteran Wireless Operators Association, have been sponsored by Alfred H. Grebe of A. H. Grebe & Company, 113 West 57th Street, New York, radio manufacturer. One scholarship will be given to an attendant student and one to a correspondent student of the Radio Institute of America, New York City, and applicants, who must be eighteen years old, will be required to submit an essay for the contest.

Duty on Single Phase Motors Reduced in Australia

The general duty in Australia on single phase motors has been reduced to 10 per cent ad valorem from 60 per cent ad valorem, according to Earl C. Squire, trade commissioner.

Gain in Electrical Exports Shown in 1928 Report

The United States exported electrical apparatus to the value of $8,606,909 in April and $34,124,694 for the first four months of 1928, as compared to $8,845,709 in April, 1927, and $32,591,183 for the first four months of 1927. Some of the detailed export values for the first four months of 1928 were as follows: generators and accessories, including steam turbine generator sets and self-contained lighting outfits, $1,871,199; motors, starters and controllers, including portable electric tools, $4,879,381; batteries, all types, $3,096,403; transformers, all types, $920,384; meters, indicating, recording and testing instruments, $828,292; radio broadcasting and receiving sets and accessories,

$2,987,533; copper wire, bare and insulated, $2,164,208; lamp bulbs, $1,787,505; electric fans, $309,195; domestic clothes washers, $521,718; refrigerating sets up to one-ton capacity, $1,673,730.

Lahl Appointed Traffic Manager of R. M. A.

W. J. M. Lahl, prominent in Chicago shipping circles for the last 25 years, has been appointed traffic manager of the Radio Manufacturers Association. He was one of the organizers of the Chicago Shippers Conference Association, and acted as secretary for six years. Mr. Lahl is familiar with traffic problems, having served on the traffic committee of the Illinois Manufacturers Association, and acting as chairman of the traffic committee of the National School Supply Association for the last five years. He is a member of the classification committee of the National Industrial Traffic League.

Sonatron Company to Produce Talking Movie Equipment

Voice-A-Phone Company, Philadelphia, has entered into a contract with Sonatron Tube Company, Chicago and New York, calling for production of a radio tube with which it is planned to reproduce specialty vaudeville acts and full-length talking feature photoplays, priced within reach of all theaters. It is initially planned to install the apparatus in 5000 theaters throughout the United States and in 1000 theaters scattered throughout the English speaking countries of the world.

Radio Commission Allocates Short-Wave Channels

The Federal Radio Commission recently allocated 74 short-wave channels for transoceanic service, and issued operating permits for 52 channels. Operating licenses were issued to the Mackay Company on 23 construction permits previously issued for transoceanic public service communication, and to the Radio Corporation of America on 29 construction permits already issued. Construction permits were issued as follows: Robert Dollar Company, eight channels; Tropical Radio Telegraph Company, seven; American Telephone & Telegraph Company, nine; American Publishers' Committee, twenty; Mackay Company, fifteen; Radio Corporation of America, fifteen.

Ryan to Produce Artificial Lightning at Stanford

Harris J. Ryan, head of the electrical engineering department at Leland Stanford, Jr., University, is making preparations to produce artificial lightning potentials of 3,600,000 volts. An impulse generator of the type first developed by F. W. Peek, General Electric Company, capable of producing artificial lightning flashes at a potential of 1,500,000 volts, is being conditioned in the university laboratory.

The generator will be the first high-voltage unit to employ cable-type capacitators in place of the glass plate type formerly used in these generators. It will be connected to the 2,000,000-volt, 60-cycle testing set put into operation in the Stanford laboratory about a year ago. The impulse voltages produced will be used in studies of high-tension transmission systems and the lightning protection problems with which they are faced.

Aviation Beacon Installed Near "White Way"

An aviation beacon, mounted atop the Lefcourt-Empire Building, and presented to the city of New York by the American Neon Light Corporation, was turned on June 5 by Clarence D. Chamberlin. It adds to the brilliancy of New York's "White Way," as it is located close to

Clarence D. Chamberlin pulled the switch turning on New York's first American Neon Airport signal beacon, within a stone's throw of Times Square. In the illustration Mr. Chamberlin (right) is shown with Otto B. Shulhof, former Commissioner of Port of New York Authority and president of the American Neon Light Corporation

Times Square. The light, marking a new departure in the erection of Neon beacon lights in this country, is cone-shaped, and consists of 20 Pyrex glass tubes, each 35 millimeters in diameter. Each tube is a little more than 13½ feet long, and there are 270 feet of tubing divided into ten independent units. Each unit is supplied by an individual General Electric transformer, specially made, so that if a tube fails, the entire beacon will remain lighted.

Technical Radio Course Being Prepared

The National Electrical Manufacturers Association is preparing a radio service course to include a handbook of technical information for the service man and a book of wiring diagrams of radio receivers and power units, on the market since 1924.

This course, being prepared in collaboration with the Radio Institute of America, will teach the principles of radio, treating only receiving equipment and accessories.

Williams Predicts Increase in Oil Burner Sales

The number of oil burners in domestic use in the United States will reach one million during the 1928-1929 season, according to C. U. Williams, president of Williams Oil-O-Matic Heating Corporation, who addressed 2700 delegates to the fourth international convention of the company, held recently in Bloomington, Ill.

C. U. Williams

Mr. Williams, who declared that business of his own corporation is far in advance of that for the same period in 1927, asserted that the rapid spread of burners is due to the continued immense supply of low priced oil, which shows no signs of lessening.

Truck Makers Undertake a Market Survey

In furthering their cooperative market development work through The Society for Electrical Development, Inc., the manufacturers of electric industrial trucks have engaged the firm of R. O. Eastman, Inc., New York and Cleveland, to undertake immediately a cooperative market research survey of this equipment. The survey, which will embrace all phases of the marketing, advertising and selling of this product, will be completed late in the fall.

Fifty Thousand Watt Lamp Shown in Cleveland

An incandescent lamp of 50,000 watts, using enough electrical energy to supply a medium sized hotel with light, was recently turned on at Nela Park, Cleveland. It was developed by engineers of the National Lamp Works of General Electrical Company. A number of public utility men from Chicago and vicinity were present at the initial showing.

Brevities

All-American Mohawk Corporation announces that sales for 1928 have exceeded those for the entire year of 1927 by more than $4,000,000. The factory of the company has been working on double shift since the first week in June.

Roller-Smith Company, New York, announces that John A. Coleman, 1006 Washington Avenue, Houston, Tex., has been appointed sales manager for Texas; H. T. Weeks, United States National Bank Building, Denver, is the newly appointed Colorado, Utah, Wyoming and northern New Mexico representative.

Holck Products Corporation, New York, recently organized for the production of speakers, is headed by three former officials of Richardson Radio, Inc. Edgar Sission, Jr., president, was engi-

neer with Richardson; William C. Erb, vice-president, was general manager; Harlow D. Gaines, secretary-treasurer, was production manager of the company.

United States Electrical Tool Company, Cincinnati, has appointed T. H. Scaffe district manager of the Detroit branch with R. N. Brayer as an assistant. Mr. Scaffe has been with the Detroit branch for several years; Mr. Brayer was previously with Boyer-Campbell Company, Detroit jobbers.

Stewart-Warner Speedometer Corporation announces the appointment of James Mayer as factory representative for the radio department; Jerry Golten, traveling radio engineer of the company, has started on a coast-to-coast trip during which he will introduce a new line of radios to jobbers.

Splitdorf Radio Corporation has appointed Wyeth Hardware Company, St. Joseph, Mo., distributors for eastern Kansas, Missouri and Nebraska; Auto Supply Company, Hutchinson, Kan., is the new central Kansas distributor; Padgitt Brothers, Dallas, Tex., will cover central Texas.

Chisholm-Moore Manufacturing Company, Cleveland, has been purchased by the Columbus McKinnon Chain Company, Tonawanda, N. Y., and will hereafter be known as Chisholm-Moore Hoist Corporation, division of Columbus McKinnon Chain Company.

Shelby Electric Company, manufacturer of electrical switchboards and switchboard equipment and appliances, is planning to erect a one-story building at Iowa Avenue and Michigan Street, Memphis, Tenn., to be used as a manufacturing plant.

Bernard Electric Manufacturing Company, 36 Flatbush Avenue, Brooklyn, N. Y., maker of power supply units for A. C. and D. C. radio sets, has opened a service department for all makes of radio sets and power units.

Hatfield Rubber Works, Hillside, N. J., has completed a new plant. Due to the recent retirement of Louis Beller and A. Beller from the directorate, the present management consists of: A. L. Hatfield, president; M. Bornstein, vice-president; M. A. Wachstein, secretary and treasurer.

John Herrel & Sons, 244 Gear Street, Columbus, Ohio, has entered the electrical refrigeration field. For many years this firm has manufactured commercial ice refrigerating equipment. It is now manufacturing cabinets for commercial use.

Adroit Tool Company, 14 Front Street, New York City, has merged with Adrola Corporation, Port Jefferson, N. Y. The combined plant is at Port Jefferson, where Adroit products and Adrola electric radio receivers are manufactured.

Frigidaire Corporation announces the appointment of H. J. Walker, Jr., as manager of the Dayton sales branch; R. H. Graham is the new manager of the Baltimore branch; E. A. Greenwald will join the factory organization at Dayton.

Coming Conventions

American Institute of Electrical Engineers
Regional meeting, Oct. 29-30, Atlanta, Ga.
Pacific Coast convention, Aug. 28-31, Spokane, Wash.

Association of Electragists, International
Annual convention and exhibition, Aug. 6-11, Chicago

Illuminating Engineering Society
Sept. 17-20, King Edward Hotel, Toronto, Ont.

International Association of Municipal Electricians
Oct. 22-26, Hotel Monteleon, New Orleans, La.

National Electrical Credit Association
Annual meeting, July 16-17, Boston

National Electrical Manufacturers Association
Policies division, July 29-Aug. 1, Association Island, N. Y.

National Safety Council
Oct. 1-5, New York City

The Society for Electrical Development
Camp Cooperation VIII, Aug. 2-7, Association Island, N. Y.

Heinsohn Electric Refrigeration Company, Inc., Charleston, S. C., was recently organized with J. Henry Heinsohn, Jr., president and treasurer and F. A. Bailey, Jr., vice-president and secretary.

Packard Electric Company, Warren, Ohio, has opened an office at 1006 Washington Avenue, Houston, Tex., under the management of John A. Coleman.

Raytheon Manufacturing Company, Cambridge, Mass., has absorbed the radio tube division of Q. R. S. Company, Chicago.

Gramling Electric Refrigeration, Inc., Orangeburg, S C., recently opened for business with Reuben S. Gramling and J. L. Gramling as officers.

Kays Company is the new name of the Vails-Kimes Company, formerly located at Dayton, Ohio. This company, which manufactures house pumps, is now situated at St. Paul, Minn.

Automatic Electric Heater Company, Philadelphia, has taken over the third floor of a building at 1706 Race Street, moving from the Schaff Building.

Walker & Pratt, 31 Union Street, Boston, announces the addition of electric ranges in color to its line of Crawford ranges.

Copeland Products, Inc., Detroit, will move into new factory quarters Aug. 1.

Personals

A. C. Stewart has been appointed sales manager of Ultratone Manufacturing Company, Chicago. He was one of the organizers of the Mid-West Radio Trade Association, serving as its president and executive secretary.

J. K. B. Hare, manager of the Columbus office of Westinghouse Electric & Manufacturing Company, has been appointed assistant central station sales manager of the company with offices in New York. He will be associated with G. E. Wearn, central station sales manager.

Henry L. Crowley, president of Isolanite Company of America, has resigned to organize the firm of Henry L. Crowley and Company, factory and main offices at East Orange, N. J.

Milton J. Barrett has been appointed a sales representative in the New York office of Grigsby-Grunow Company, Chicago.

Charles A. Terry has been elected a director of Westinghouse Electric & Manufacturing Company, succeeding the late Guy E. Tripp.

C. Irving Dwinell has been appointed manager of the Boston branch of United States Electrical Tool Company. He was formerly sales engineer with General Electric Company at its Providence, R. I., headquarters.

Oliver B. Capelle has been appointed to take charge of sales promotion for the Electric Vacuum Cleaner Company, Inc., Cleveland.

George Smith has been elected a vice-president of Hanson, Van Winkle, Munning Company, Matawan, N. J.

Removals

Cello, Inc., manufacturer of lighting fixtures, from 19 W. Houston Street, to 96 Prince Street, New York City.

Crystal Switch Plate Corporation, from 44 Whitehall Street, New York City, to 92 Hinsdale Street, Brooklyn, N. Y.

Minerallac Electric Company has moved from 1045 Washington Boulevard to 25 N. Peoria Street, Chicago.

Ohmite Manufacturing Company, from 214 West Ontario Street, Chicago, to 642 North Albany Avenue.

Operadio Manufacturing Company, from Chicago to St. Charles, Ill.

Silvray Company, Inc., from 55 West Sixteenth Street, to 53 West Fourteenth Street, New York.

Standard Light Company, Milwaukee, from 424 Chestnut Street, to 311 Fifth Street.

S. Robert Schwartz & Brother, from 546 Broadway, to 160 Varick Street, New York City.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City.

"Hollingsworth" Emergency Lighting Systems.
"H. K." Threadless Bushings.
"Splendida" Electric Iron.
"Sal. Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Wharton" Battery Charger.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Blaisdell" Automatic Electric Cigar Lighter.

"Corona" Fireless Cooker asked for in our June issue is manufactured by Landers, Frary & Clark, New Britain, Conn.

"Amico" Factory Horn asked for in our June issue was formerly manufactured by Model Instrument Co., Worcester, Mass., but is now being made by Signal Engineering & Mfg. Co., 158 W. 14th St., New York, N. Y.

Cross-Licensing Patents Planned *to Expand Radio Trade*

Agreement features Radio Manufacturers Association convention and exhibition at Chicago

MEMBERS of the Radio Manufacturers Association in session in Chicago on June 13, during their fourth annual convention and second annual Radio Trade Show, approved the patent interchange agreement drawn up by the board of directors. Designed to eliminate costly patent litigation, this plan provides for classification of patents held by members into two groups: Class A, the basic patents; and Class B, patents of the ordinary type, non-basic in character. The agreement covers the Class B but not the Class A patents.

When 51 per cent of the membership have signed the agreement to pool their Class B patents, the R. M. A. board of directors is given the right to license all signatory members to use such patents without charge. Any patent owner, however, may himself license anyone else he chooses. Classification of patents is to be decided by the board of directors. If the member patent-owner and the board are not able to agree, the question is to be submitted to arbitration.

The agreement does not contain any restrictions as to output, territory or price; nor does it restrict trade activities in any manner. It is limited to patents of the United States, and for use only in radio devices, electrical phonographs, group address systems, and parts or accessories therefor.

Plan Is a Progressive Step

APPROVAL of the plan was characterized by C. C. Colby, retiring president of the R. M. A., as the most progressive step ever taken by the industry, a step which would enable the industry to go forward even faster than it has during the past four or five years without the aid of such a plan. As to its sales effect:

"If it is true that there are approximately only a million and a half radio receiving sets on the farms," he said, "it can be expected that under the impetus of the patent agreement the rural population will quickly be brought within the great listening audience, which now numbers 35,000,000."

The vote in favor of the adoption of the plan did not commit the individual members to sign the agreement. It is not compulsory upon any member to sign, but it is believed that a high percentage of the members will sign the agreement because of the benefits to be derived from it in the form of eliminating patent litigation.

WHAT patent interchange has done for the mutual advancement of automobile manufacturers is one of the outstanding reasons for the remarkable growth of that industry. Similar advantages are expected to accrue to the radio industry through the plan under which Class B patents will be interchanged among the manufacturing members of the Radio Manufacturers Association

The constitution and by-laws of the association were changed to make adoption of the plan possible. Dues were revised so that members will now pay annual dues in proportion to the volume of their gross business. Dues are now on a sliding scale, from $200 for companies having a gross annual business under $200,000, to $5,000 a year for those whose gross annual business exceeds $15,000,000.

The display of sets, parts and accessories at the second annual Radio Trade Show was the most complete and inclusive ever brought together by the R. M. A. Something like $1,000,000 of radio merchandise was exhibited in 265 displays by 210 members in a total of 30,000 sq. ft. of space, compared with 18,000 last year In addition 155 rooms in the Stevens Hotel were used for demonstration purposes. About 24,000 representatives of all branches of the industry attended the show and the conventions of the R. M. A., the Federated Radio Trade Association and the National Association of Broadcasters.

Distributing Groups Cooperate

THE F. R. T. A., representing the distributing channels of the R. M. A., was greatly strengthened during the convention. The significance of the welding together of the various distributing groups under the F. R. T. A. is that local associations, dealers, jobbers and manufacturers' agents now have a parent organization through which they may coordinate their objectives and eliminate cross-purpose policies.

The show revealed nothing which should scrap stocks of good merchandise. There are no radical changes in set construction, although more die-cast aluminum is being used, and all radio products show refinements, with beauty of appearance stressed. This is particularly evident in console design; furniture, in fact, featured the show. It is better built, in better taste. Some follows modern art design and some uses color.

A. C. receivers dominated the exhibts, but D. C. sets were also shown, and the battery and power unit exhibitors anticipated a large selling season.

Electro-dynamic types predominated among the speakers. A total of 32 manufacturers were prepared to furnish dynamic speakers and 28 were ready to supply the magnetic type.

Television kits were exhibited and television reception was demonstrated at the show. Interviews with several parts and speaker manufacturers emphasized this point: Welcome every television development with open arms, but tell the public at every opportunity that television, even if perfected, will not mean the scrapping of radio receiving sets. Rather it will mean apparatus in addition to and for use in conjunction with audio receivers—new merchandise to sell rather than old merchandise to scrap. Several exhibitors expressed the conviction that the responsibility for telling the public the truth about television, so that it may help rather than hinder radio sales, rested upon the radio industry itself.

Major Herbert H. Frost, vice-president, Kolster Radio Corporation, was elected president of the R. M. A. Three vice-presidents were elected: V. W. Collamore, general manager, Atwater Kent Manufacturing Company; Morris Metcalf, treasurer, American Bosch Magneto Corporation; Lester E. Noble, president, Federal Radio Corporation. John C. Tully, president, Bremer-Tully Manufacturing Company, was chosen treasurer.

Applying Insulating Materials to Coils and Windings

No. 3 of a Series on Insulating Varnishes and Impregnating Compounds

Stator and rotor windings can be subdivided into groups depending on the type of winding and the service conditions under which they operate

BY D. H. BRAYMER
Consulting Engineering Editor,
ELECTRICAL MANUFACTURING

AND A. C. ROE
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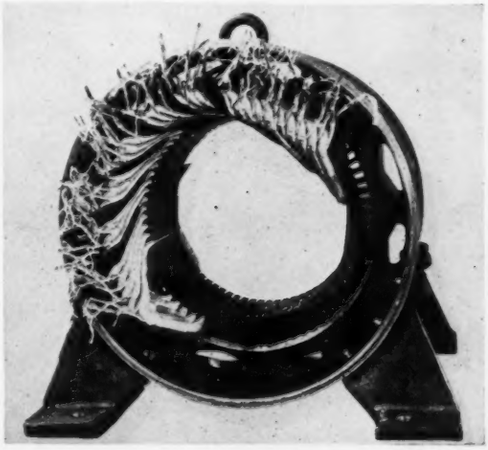
IN the section of this article that appeared in the June issue the procedure when applying insulating varnishes to coils was outlined. In the present section the details of good practice in applying insulating varnish by dipping and baking to the completely wound apparatus will be discussed.

Completely wound apparatus can be divided into two main groups: A.-A. C. Stators or stationary types of windings; B.-A. C. and D. C. rotors.

Stator windings can be subdivided into groups according to types of windings and their applications in service. For this group there is a standard treatment and special treatment for each type of winding. For convenience in this article stator windings will be discussed under three classes, as follows:

Class I—Single-phase induction motors with squirrel cage rotors. Up to 1 1/2 hp., one dip in a black plastic varnish after winding the stator will be satisfactory for usual applications of this motor. The stator should be preheated one to two hours, depending upon the size, and dipped while warm, allowing the winding to soak 10 to 20 minutes after all bubbling ceases.

For this class of winding, Banolite black plastic air drying varnish can also be used. In this case, the stators should be preheated one to two hours, dipped and drained and then baked for two to five hours, depending upon the size, or they can be air dried. The baking, however, gives a better job and a longer life to the winding. For special applications such as exposures to moisture, oil, etc., two dips can be given, or for extreme cases four or five dips.



This illustration shows a two-layer winding using diamond mush pulled coils. Varnish insulation for this stator falls in Class II. When completely insulated coils are used in open slots Class III procedure is followed

Class II.—This includes two and three-phase stators with partly closed slots. When the two layer diamond mush type of coil is used, and regardless of whether the coil ends are taped or not, one dip and bake in a black plastic baking varnish or the Benolite air drying varnish will be satisfactory for standard applications. Two dips should be given for providing medium oil and moisture proofness, four to five dips where especially good insulation is required. The treatment in each case includes preheating, dipping while warm, soaking and baking.

Basket Winding Employed

IN this class is also included the basket type of winding. This winding requires more time in dipping and baking operations, due to the fact that all coil ends are taped with a layer of treated cloth and cotton tape. In the early days the treatment applied to this type of winding consisted in shellacking the hidden parts while winding and giving the finished winding a coat of shellac and a coat of black air drying varnish. Under standard applications of motors, this application of varnish insulation sometimes stood up for good periods, but it is not as safe a procedure as to apply good plastic varnish, making sure that it gets into the winding thoroughly, and then baking slowly at 212 deg. Fahr., so as to completely drive off all of the solvent in the varnish used.

Class III.—This class includes open slot stators using completely insulated two-layer diamond shaped coils. The treatment for this type of winding in a repair shop will vary according to the voltage of the winding, size of stator and the service application of the motor. For usual applications and voltages up to and including 550 volts, there are three satisfactory methods of treatment, each having its special merits.

The first treatment for this class is to spray a coat of black glossy air drying varnish on the finished winding. This treatment should only be used when the coils in the winding have been treated with insulating varnish by dipping and baking, as described in the June article. This treatment does not allow the maximum benefits to be obtained from dipping and baking the completed winding.

The second method of treatment for this type of winding saves time and if the coils are used at once the finished job will give good service. This method, however, is recommended only for rush rewiring jobs. The coils are dipped and baked before applying insulating tapes, but are not dipped after applying such tapes. They are put into the stator in an untreated condition. Such coils should not be allowed to hang around the shop for any length of time, since the pores of the tape will get filled with dust and make it hard to get a good varnish treatment on the finished winding. After the winding operation is completed, the complete stator is preheated, dipped, soaked and baked. When time will permit it is a good plan to spray a coat of black glossy air drying varnish on the winding.

Dipping and Baking Important

IN the third method of treating this class of winding, the coils should be dipped and baked before and after applying the insulating tape. After the coils are wound into the stator, the completed winding should be dipped and baked. This method takes longer than the others and is more expensive, but the result is a better insulated job, and one that will be capable of withstanding severe punishment in service. After the dipping and baking the required number of times, depending upon the kind of service the motor is subjected to, the finished winding should be given at least one dip, and baked and sprayed with a coat of black glossy air drying varnish.

As already mentioned, the number of dips and bakes to be given a finished winding will depend upon the voltage of the motor and the kind of exposure the motor is expected to withstand. The details in this connection given for coils in the June article can be followed with safety for the application of varnish to completed windings.

When completely wound apparatus is too large to be handled in existing varnish tanks, but the baking facilities are adequate, the varnish can be poured over the winding several times. The best job can be done when the motor stator is hung or turned over horizontally to allow the varnish to penetrate the slot sections. The stator should then be turned over and the varnish poured over the winding from the opposite side.

When it is impossible to bake the apparatus, a number of coats of a black glossy air drying varnish should be sprayed on. In this case, care must be taken to get the varnish well in between the layers of coils on the ends, and well into the space between the coils as they leave the slots, and also around the leads and stub end connections. A surface job of this kind does not provide much protection for the vital spots in the winding and should be used only in an emergency.

It is in order at this point to state that the application of varnish to a finished stator is as important as the application of insulating tapes or the winding job itself, and therefore should not be delegated to a shop helper. The action of the varnish in the different treatments can best be observed when being applied, and from an insulation and protection standpoint, to provide the best possible job, the treatment of the completely wound stator should be in the hands of an experienced operator.

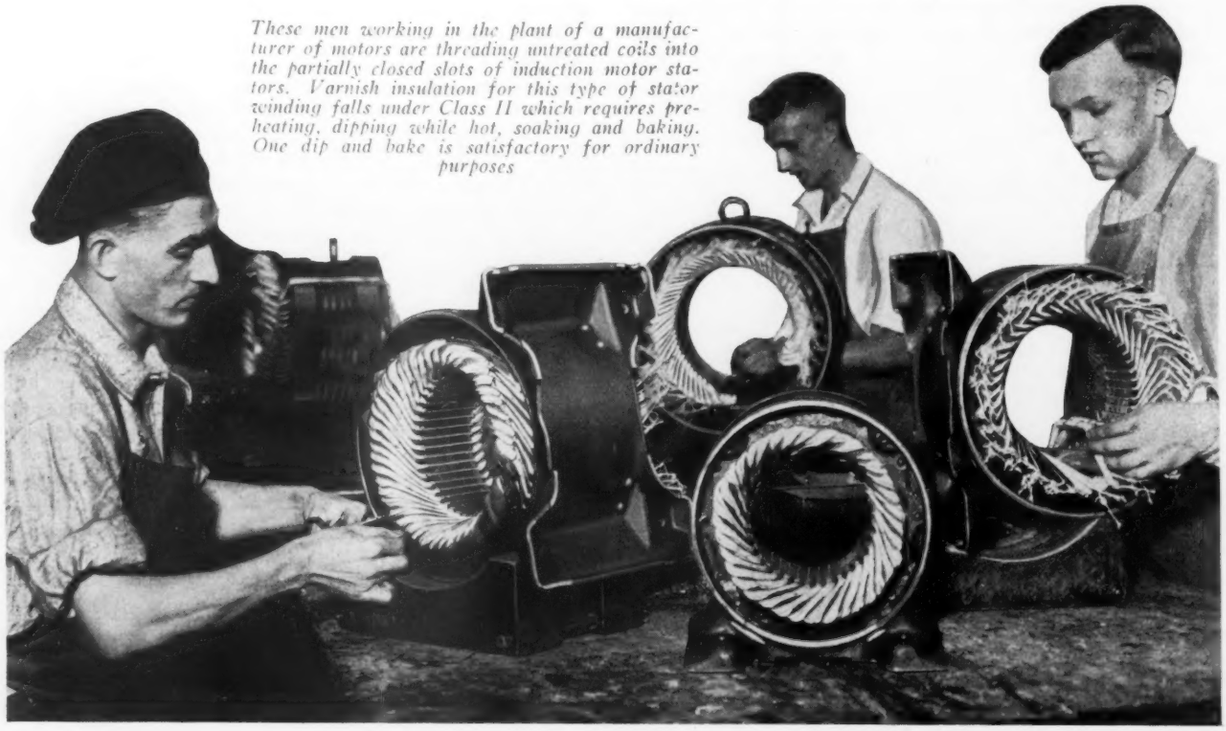
For each of the above methods of treating completely wound stators, the advantages and merits can be outlined as follows:

When a completely insulated and varnish-treated coil is wound into a stator, a tight driving fit must be established in the slot sections by the use of paper winding cells and fillers; also a certain amount of pounding is required to shape the ends of the windings to set them in place. This driving and shaping mars the finish on the coils, and in some instances cracks or bruises the insulation and finish on the coil. But by dipping and baking the wound stator, a new varnish film is given the completed winding, and extra insulation added to any spots that may have been damaged.

Hot Spots Cause Trouble

THE dipping and soaking operation lets the varnish in between the laminations, and when baked reduces the chances for loose iron making contact and setting up eddy currents or hot spots that occur when untreated laminations close together in a rewinding job. These hot spots are liable to cause more trouble to the coils and their insulation than actual overloads on the motors.

When the completed stator is dipped, the varnish also penetrates between all coil ends, under the leads and jumpers, fills up the pores of insulating tape used on stubs



These men working in the plant of a manufacturer of motors are threading untreated coils into the partially closed slots of induction motor stators. Varnish insulation for this type of stator winding falls under Class II which requires preheating, dipping while hot, soaking and baking. One dip and bake is satisfactory for ordinary purposes

and other connections, and also fills up any rope or cord used to tie coil ends to rings or blocks. The varnish also treats and fills the cut edges of material used for winding cells, fillers, etc., seals the wedges, and gives a coat of varnish to the iron at the ends of the slots, filling up small cracks at this point. When properly soaked, the varnish will penetrate into the slot section and thus seal them against oil, moisture and the like. When carefully done by an experienced operator, the dipping and soaking of a completed stator will provide an insulation that will withstand for a long time most severe operating conditions.

Varnish Should Be Easy-Flowing

FROM what has been said, it is obvious that the second method of treatment is superior to the first method described, and that the third method is far better than either the first or second. In each of these three methods, the varnish at the time of dipping should be fluid enough to flow easily, and all air ducts in the core should be thoroughly cleaned, with this in mind, before the winding in of the coils. When the varnish job is completed all the air ducts in the core should be inspected, to make sure that they have not been clogged up. This will reduce the ventilation of the motor and increase its operating temperature. Trouble from this source can usually be traced to thick and heavy varnish that will not dry thoroughly. It is important to test the specific gravity of varnish used and keep this at a constant value.

Under the heading of treatment of completely wound rotors, both A. C. and D. C. rotors will be discussed. In the A. C. class are rotors of the type used in single phase repulsion induction motors, which include rotors with mush coil windings, insulated and bar type coils, and the simple squirrel cage rotor and the wound rotor

In the wound rotor class, we have all types of windings—the two-layer diamond and basket type, two-layer diamond threaded in layer wound coil type, the open slot insulated two-layer diamond pulled coil winding, and the strap copper two-layer diamond insulated coil with open slots, overhung teeth core construction and the like. This last type of winding is found on the larger sizes of rotors used up to and above 1500 hp.

It is obvious that the varnish treatments for rotors must vary with the type of winding used, the rotor diameter, the rotor speed and the voltage of the motor. In the case of a high voltage stator winding more care is required in the selection and application of the treatment of the rotor than in cases where the lower voltages are used.

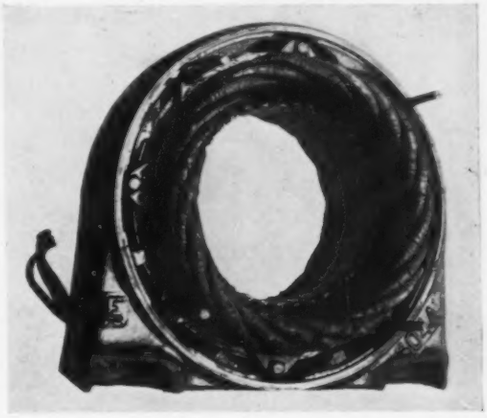
Preheating of Rotors Necessary

THE basic requirements of a varnish for the dipping and baking of rotors are as follows: It must not soften under heat. It should be plastic, not hard and brittle. It should have a cementing action when dried. The varnish must be fluid enough to penetrate and flow well, and should not be of the quick drying type. A quick drying varnish does not drain well, and when used leaves wet spots in the winding. All rotors to be dipped and baked should be preheated, since this insures better filling and draining.

Do not use a varnish for the dipping of any type of rotor unless the varnish has been tested and found to be moisture and slightly oil proof and will not throw out in service. This last point is most important. As a general rule, the amber varnishes will be found better in this respect than the black plastic types, although there are a number of good black plastic baking varnishes that give a good non-throwing film coat.

The single-phase repulsion induction type of rotor has a commutator, and usually there is some sort of short circuiting mechanism incorporated in the commutator. In some of the older types, there are two or three weights on one end of the armature that move out and in as the armature speed changes, and connected to these weights are push rods that operate the short circuiting device in the commutator. It is obvious that this type of rotor has a number of hinges and sliding parts, and therefore these parts should be removed before the rotor is dipped. If this is not done, the varnish will impair the operation of the short circuiting mechanism, since the varnish will get into the hinges and on the parts that move, and slow up if not prevent their action entirely.

Any rotor with a commutator should be dipped with the commutator end up. Do not submerge the rotor any farther than one-quarter inch of the back of the commutator necks.



A completely wound stator using basket coils has this appearance after being dipped in insulating varnish and baked

A rotor with a mush type of winding should be allowed to soak and must be thoroughly baked. The dipping should be done after the winding has been connected and banded. This insures good treatment of all joints, tapings, etc. This also applies to the threaded-in type of two-layer diamond shape coil winding. The dipping and baking of this class of apparatus binds the individual wires of the coils together, preventing movement and chafing of the insulation on the wires and subsequent burnouts from shorts.

The dipping and baking of a rotor using open slot insulated two-layer diamond pulled coils is the same as outlined above. In general the following points apply to the three types of rotors mentioned.

Keep the collector rings up and out of the varnish. Unless the varnish used dries with a hard glossy film, it may retain a slightly tacky finish, which will allow carbon and metallic dust to accumulate during operation on the sides and between the rings, increasing chances for flash-overs. Therefore, the ring supports, etc., can be given one or two coats of a black glossy air drying varnish.

All rotors should be finished before dipping, that is, bands put on, rings turned, and polished. This allows the removal of turnings, and if varnish does get on the surface of the rings, it can be cleaned off later.

In the case of the rotor using the open slot insulated type of coil, the winding can be sprayed with an air drying varnish if the coils have had at least one dip and bake after being insulated with tape. This kind of treatment saves some time, but does not give as satisfactory a job, or the seal that the dipping and baking method provides. The number of dips can be varied to meet conditions.

The rotors using open slot insulated coils are mostly lap wound with jumper leads and star connections of rubber insulated cable fastened together with cleats or cord bands. The dipping and baking helps to make these bindings stronger.

The concluding section of this article on applying insulating materials to completed apparatus will appear in the August issue of ELECTRICAL MANUFACTURING.

Lead and Zinc—

No. 4 of a Series of Articles on Common Materials

Making lead sheathing to protect cables starts with melting the pigs. Those on the platform are about to be placed in the oven for that purpose. The actual sheathing of the cable with the molten lead takes place in the lead encasing machine

LEAD and zinc are closely associated metals, both in their origin and electrical uses. They are the two principal battery metals of the electrical industry. Zinc blende is frequently encountered with galena, the most common lead ore, and although metallurgists until very recently looked upon the too intimate mixture of the two as an insurmountable obstacle to their proper separation and industrial usefulness, science has overcome these drawbacks of kinship. The most important source of supply for the ores of both metals is Missouri, Joplin being the market center.

Lead is a soft, bluish-gray, lustrous metal, highly malleable and ductile, with a specific gravity of 11.3, being the heaviest of the common metals. In the solid state a cubic foot of lead weighs 708 pounds, and, when molten, 664 pounds. It melts at 327 deg. C. and is supposed to boil at 1525 deg. C. Its relative electrical conductivity is 8.42.

Commercially lead production falls into two divisions—so-called "soft lead" and desilverized lead. The former is derived from the lead ores of the Mississippi Valley which are almost free from silver, whereas this precious metal is more or less associated with lead in the ores of Idaho, Utah, and other Western States. Idaho lead ores contain 7.12 per cent of lead and yield 4.12 ounces of silver per ton. The lead recovered from all silver-bearing ores is marketed as *desilverized* lead. The total production of approximately 800,000 tons in 1927, consisted of 560,000 tons of desilverized and 240,000 tons of "soft" lead. About 86 per cent of this was mined in the United States, the remainder having been smelted in American plants from foreign ores and base bullion, chiefly Mexican.

Although a metal of antiquity, being separated by the Greeks from silver by the use of a cupel, lead is now being produced by methods that in the last few years have undergone complete transformation. Selective flotation, in which separation of the various minerals is attained by using oil to produce a mineral-bearing froth, added last year, according to authorities, 110,000 tons or 16 per cent to the American supply, constituting recovery from ores which in former years were looked upon as commercially unsuitable for smelting. This applies with equal force to zinc; in fact, selective flotation, time and again in the last year or two, caused a temporary oversupply of zinc.

Electrical uses of lead, direct and indirect, make up an impressive part of the total consumption, the requirements of storage battery manufacturers alone ranging between 175,000 and 190,000 tons a year. Aside from the metal required for battery plates, oxide of lead is used to coat them. The quantity of disused battery plates moving into secondary smelting plants has a decided bearing on the lead market, untoward conditions in 1927 being ascribed in a large measure to the scrapping of more storage batteries than was normally expected. Battery terminal posts, bus bars, straps, etc., are cast from lead.

Next in importance is the use of lead in the form of covering or sheathing for cables. The annual consumption of lead for this purpose absorbs approximately 160,000 tons, but in some years it has been as high as the consumption of lead in battery plates. Special lead-encasing presses are used to sheath electric cables.

Other Electrical Uses

LEAD, in sheet form, finds extensive use in the lining of wooden tanks for the larger stationary types of battery cells. Sheet lead is also used by electroplaters and in electrochemical plants to protect sundry utensils and receptacles from corrosion by sulphuric, hydrochloric and other acids. Electrochemical plants also use lead pipe for electrolytes.

A good deal of lead is consumed in the electrical industry in the form of bearing metals and solder. An anti-friction metal, known as "lead tape" and consisting of 95 per cent lead, 4.5 per cent antimony, and 0.5 per cent tin, is used on electrical conductors. Dynamo bearings call for anti-friction metals with a content of about two-thirds lead and one-third tin. Lead also plays an important part in fusible alloys used in fire and sprinkler alarm signaling systems.

Lead and zinc lend themselves admirably to the die-casting of ornamental parts of lighting fixtures, decorative effects being obtainable in this manner at relatively low cost when physical and electrical properties are of little importance. In electrical porcelain and illuminating glassware considerable lead is consumed in the form of lead carbonate and oxides.

Lead as well as zinc, in the form of pigments, finds extensive use in paint, used as a finishing material to prevent rusting of heavy electrical equipment. Although generally looked upon as an impurity in brass and bronze, up to 2 per cent lead is frequently added purposely to brass castings to harden them and improve their cutting quality.

Virgin lead is usually marketed in the form of pigs or

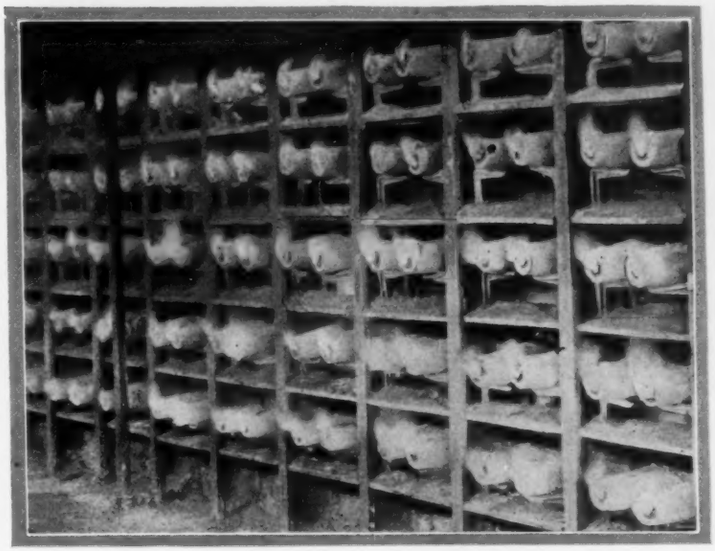
How the Industry Uses Them

These metals are frequently found together in ores. They are the two principal battery metals of the industry and have many other electrical uses

By William Crawford Hirsch

notched ingot bars, weighing 25 lbs. each. For many uses antimony is added to lead to impart greater hardness to it, and such antimonial lead is sometimes referred to as "hard" lead—a term that is frequently misinterpreted as denoting an unalloyed lead harder than the so-called Missouri "soft" lead. There is very little physical or chemical difference between desilverized and "soft" lead; and the specifications of the American Society for Testing Materials list both of them as common lead. Lead is sold by the pound.

Sheet lead comes in rolls and base prices quoted are for sheets weighing 2½ pounds per square foot and more, sheets as well as pipe being sold by the pound, the base price for the latter pertaining to pipe ⅜ to 6 in. I. D. Lead is also marketed in ribbon and wire forms.



This is a furnace in which zinc is reduced to a molten state. The next step is to cast it into slabs. The fumes seen rising from the retorts are caught and used in the manufacture of sulphuric acid and other by-products

Zinc, formerly commercially known as spelter, is a bluish-white metal with a bright luster when polished. It is principally derived from blende ore, the more abundant of zinc-bearing minerals, which is mined chiefly in the so-called Tri-State district where Missouri, Oklahoma, and Kansas meet. Wisconsin also makes a small contribution to the zinc ore supply. Flotation of complex ores in the Western mining States is, however, becoming more and more of an important source. New Jersey, where, near Franklin, zinc ores occur in oxidized form, produces approximately 100,000 tons of zinc in various forms annually . The two principal producing methods are distillation and electrolytic treatment. Zinc has a specific gravity of 7.14. It melts at 419.4 deg. C. and boils at 930 deg. C. Its electrical conductivity is 29.57.

While brittle at ordinary temperatures, zinc, when heated to between 100 and 150 deg. C., becomes malleable. When heated to about 200 deg. C., it again becomes brittle, so much so that it can then be reduced to powder. When carefully rolled and annealed, the tensile strength of zinc becomes astonishingly high. Zinc is virtually unaffected by dry air. Dampness tends to convert the surface of the metal into a basic carbonate of zinc that protects the metal from further change. Zinc is very easily soldered, a property of great industrial advantage in assembling parts into a whole which, because of design, would be difficult to shape.

In primary batteries sheet zinc is used for the shell or cup. In plate or other cast forms, zinc serves as the negative element of the primary battery, chloride of zinc in solution being used as electrolyte. Zinc anodes find wide employment in electrolytic processes. The metal's electro-positive character also makes it highly suitable as a precipitant in the cyanidation of gold, silver, platinum, etc.

Approximately two-fifths of the zinc produced finds its way into protective coatings for other metals, especially steel. This coating is commonly referred to as "galvanizing," but a considerable volume is the result of an immersion process, the object being dipped in the hot metal and not electro-galvanized in which process the metal is deposited from a zinc anode in the presence of an electrolyte of zinc salts. A good deal of zinc-coated steel cable is used in light, power, and telephone lines.

Industrial lighting fixtures are frequently zinc-coated. Tubs of electric clothes washers are some times zinc-coated and sheet zinc is used in the cylinders of the revolving-reversing type. In some makes of enclosed type fuses zinc is used as the fusing element. Sheet zinc stampings serve as frames and base shields in some watt-hour meters. The backs of some types of annunciators are of sheet zinc.

Next to "galvanizing," the most important outlet for zinc is in the manufacture of brass which is an alloy of copper and zinc. Electrical uses of brass will be considered separately later in this series.

The ordinary commercial form of slab zinc is known as Prime Western. Purer forms are: Selected, Brass Special, Intermediate and High Grade. Slabs measure 15½ x 10 x 1½ in. and weigh 50 lb. Zinc is sold by the pound, quotations being either for East St. Louis delivery or New York. Zinc is also obtainable from producers in anode and dust form. Rolled zinc comes in sheets, plates, strips, ribbons in coils, corrugated and perforated sheets. Sheet zinc comes in a wide range of gages and is usually packed in casks containing about 600 pounds, an extra charge being made for smaller packages. Sizes range from 24 x 84 to about 48 x 108 in. Extra cost over base prices applies on many widths and thicknesses. Nickel-plated sheet zinc, polished on one side, is a standard commodity.

Trend of Lighting Equipment Toward Modern Art Proves That

Fixture Design Breaks Its Shackles

Artistic Lighting Equipment Association convention and show emphasize beauty as the chief sales appeal for modern fixtures

FIXTURE designing has broken most of its shackles. There are still some designs which have not progressed far enough from the days of the combination gas and electric fixtures; but almost every one of the 125 exhibits at the National Lighting Equipment Exhibition, held at Hotel Sherman, Chicago, June 11-16, included some designs which, differing sharply from traditional ideas, expressed the desire of manufacturers to meet the modern demand for beauty in the home.

This tendency toward variety and freshness of design was most noticeable in the several exhibits which featured modern art designs. The public, as Dr. M. Luckiesh, director of the Lighting Research Laboratory of the National Lamp Works, General Electric Company, said at the show, needs a new deal in lighting, and the new art movement affords a rare opportunity for the designer to introduce valuable novelty.

THAT lighting equipment manufacturers need to develop more concentrated and intensive selling methods was stressed at the A. L. E. A. convention in Chicago. One sign of a trend toward that end is the fact that the association plans to make a study of high distribution costs in an effort to find means of reducing the waste in selling

Outstanding among the exhibits of modern art designs was the line shown by the Beardslee Chandelier Manufacturing Company, described by Dr. Luckiesh as "a perfect coordination of modernistic forms and color with good lighting principles." This line drew much attention.

C. Weiler of J. G. Braun, Chicago, urged the parts and stamping manufacturers, in aspiring toward new art designs, to keep their feet on the ground by studying the new art movement thoroughly before attempting to create fixtures which reflect it.

Color Features New Fixtures

COLOR was also a feature of the exhibits by 105 of the 248 members of the Artistic Lighting Equipment Association. Color is blending down from the shades into the standards of portable lamps. Color is even adorning kitchen glassware and metalware. Some manufacturers are conservative in adapting color to their lines; others are radical. There were many shades which were distinctly beautiful, but not a few which at least bordered on the freakish in their attempt to be new and different.

That lighting equipment in this modern day must be sold on the basis of its beauty of design and decorative appeal was the merchandising keynote of the A. L. E. A. convention. Homer J. Buckley of Buckley, Dement & Company, Chicago, emphasized the fact that the highest fixture sales appeal these days is directed to the artistic and aesthetic sense of the woman buyer.

Mr. Buckley protested with force against what he termed the "volume craze." The craze for mere volume sales at doubtful profits, or none at all, must be checked. Economic waste in salesmanship must be overcome and selling by the manufacturer as well as the dealer must be concentrated where it will bring sure profits.

"Selling," he said, "needs more concentration and less generalization; it should be characterized by more intensive and less mass effort. The manufacturer and the jobber are automatically partners with the dealer. The manufacturer too often forgets that the selling transaction is not complete until the dealer moves the goods off his shelves.

"The manufacturer needs to choose his jobbers and dealers carefully, and then stand back of them. He must give them his full support. He must help them to sell to the maximum of his ability. Creation of an effective selling process is the chief objective of the manufacturer as well as of the wholesaler and dealer.

"The manufacturer needs to remember that service is giving his jobber and dealer what they pay for, plus a lot of things they don't pay for, and which cost the manufacturer nothing. Service is the from-the-heart attitude toward the trade and the customer. There are three curses against the advertising done by the manufacturer. Too much of it is self-glorification; what are you selling, pictures of your factory and yourself, or your lines? Too much of it is spasmodic; it has no continuity. Too much fails to help the dealer in his community, because it is too general."

Miss Irene P. Sidley, secretary of the Woman's Interior Decorators' Association, appealed for less ornamentation and more simplicity in lighting fixtures.

"It is the men who are doing the ornate things in home furnishings," she said, "while the women are striving for simplicity. We want beautiful things, not monstrosities. Wrought iron fixtures that I have seen have far too many curlicues. In fact, some of them have hanging on them everything but the kitchen stove. Simply to urge that a fixture is new in some detail does not mean that it is desirable. The very feature which is emphasized in many cases may ruin an otherwise perfectly good product."

Granville P. Rogers, managing director of the A. L. E. A., reported that of the 2272 claims filed during the past year, amounting to $250,840.93, a total of 1377, amounting to $136,147.45 had been collected without cost to the members.

To Study Distribution Costs

MR. ROGERS pointed out that one of the most important activities of the association is that of arbitrating cases covering copying of designs, infringements of patents and unethical practices. A total of 38 such cases were adjusted during the past year, without publicity, and all by Mr. Rogers without resort to the arbitration committee. Eight cases were withdrawn and eight are in process of settlement.

It was decided that one of the most important matters which will be taken up at the January convention of the association will be the cost of distribution. Fixture manufacturers realize that the high cost of distribution is a serious detriment to successful business in their field. The association will undertake a serious study of the high cost of selling goods, and remedies will be proposed.

A credit bureau is to be organized by the association.

Systems for Distributing Electrical Goods

(*Continued from page* 12)

One of the most successful manufacturers in the electrical industry attributes his success to the flexibility of his sales plan. Because the system that it follows approaches the ideal for an appliance manufacturer, I am going to describe it in detail, disguising it slightly so that the company I am writing about cannot be too easily identified.

This company has a big-calibered general sales manager. Under him are four sectional sales managers. Each sales manager has an average of ten branches to look after. Each branch is in charge of a manager. Working out of each branch are from nine to twelve district managers. In each district there are from two to five field supervisors, and working under these supervisors there are 3000 salesmen. There is a supervisor for each six salesmen.

Supervisors Cannot Be Hired

THE company's biggest task is to keep the ranks of its district managers and supervisors recruited up to its requirements. When a new district manager is wanted a supervisor is pushed up a notch. The organization can expand no faster than its force of supervisors. Salesmen can be hired and whipped into producers in a short time. But supervisors cannot be hired. They are promoted from the ranks of the salesmen. Ordinarily it takes a year or two to make a supervisor.

If this company wishes to add 300 salesmen in New England, because of flourishing conditions there, the first thing it must determine is, if it has fifty salesmen who have demonstrated that they are of supervisor caliber. If the fifty new supervisors are available, increasing the sales force will be a simple matter.

On the other hand, supposing the business situation in a certain section does not warrant as many salesmen as are now being employed. Let us assume a county where six salesmen and a supervisor are working. As the sale of the appliance slows up in this county, the salesmen finding it impossible to make a living, will one by one throw up their jobs and seek employment elsewhere. If the conditions are particularly bad, all six salesmen will leave. This will leave only the supervisor in the county. He will try to handle it alone until conditions improve and his district manager decides it is again time to give him some salesmen. This plan of operation is so elastic that no conceivable situation could arise to which the system could not adjust itself.

Sales Made for a Retailer

THIS manufacturer does not sell direct to the user. All sales are made for a retailer in the locality. The salesmen work two days in the field and one day in the retailer's department. They alternate in this arrangement, so that there is always at least one salesman in the store, except during periods of rare depression, when the territory is being held down solely by a supervisor.

All men in the sales department, from the general sales manager down, are paid only a commission. The sales managers are guaranteed a certain income.

The earnings of this organization average unusually high: salesmen, $48 a week; supervisors, $3,000 to $6,000 yearly; district managers, $4,000 to $18,000 yearly; branch managers, $6,000 to $30,000 yearly.

Persistent and Consistent Sales Effort: When I say that a sales plan should be "consistent" I mean that the manufacturer should have policies and stick to them. If he is in the grocery business he should not sell through hardware stores, as one of the packers tried to do recently. If it is his policy to sell direct to large users, he should frankly admit that it is his policy. Neither should he be constantly switching policies every time a new condition arises.

The word "persistent" in a sales plan is easier to explain. All it means is that a manufacturer should keep everlastingly at his selling. He cannot afford to relinquish his efforts for a single day. This is especially necessary in the electrical business. There is scarcely a product in it that will sell itself. Most electrical articles require the most intensive kind of selling. Even after they are sold it is necessary to prod the buyers to get them to use what they have bought.

One of the best known sales managers in the electrical industry said to me recently, "Do you realize that there are 55,000,000 empty lamp sockets in this country? Do you know that there are thousands of appliances gathering dust in attics? Our big problem is not only to get people to buy, but just as hard a problem is to get them to use our products after they have bought them. With this in mind a good portion of our advertising effort is directed to the people who already own our goods. We try to keep them enthusiastic about them. That is the only way we can induce them to get the fullest benefit from our merchandise."

What Proper Maintenance Will Accomplish

SCATTERED instances of exceptional motor service are more or less common, but it is unusual to find a complete installation of *27* years ago giving complete satisfaction after such long service. However, such is the case at the plant of the Julius Brandes Mfg. Co., Paterson, N. J., makers of silk ribbons.

Slightly over *27* years ago a German engineer designed and supervised the installation of the entire power system in this plant. Although it was one of the first alternating current installations in this country, it remains today practically as it was originally. The five Westinghouse motors have never been overhauled or had anything but minor repairs made, with the exception of one which has had a new set of bearings. Each of them is used to drive line shafting as the motive power for various textile machines, such as looms, winders, warp-making machines, etc. In each case the load is slightly in excess of the 30-hp. ratings of the motors.

Undoubtedly, the whole secret of this remarkable record is in the fact that all equipment is kept extraordinarily clean and is regularly inspected and oiled.

Originally there were as many old type Westinghouse knife starters, but only two remain today, simply because the fire and insurance inspectors condemned the balance because of sparking dangers when they were thrown in and cut. The remaining two are still giving satisfactory service and need occasionally only new knives, handles, etc. The old switchboard still carries its load and has never needed any repairs.

Whether or not the success of this installation is due to the foresight of the designing engineer, the fact still remains that the equipment has stood the gaff of ten hours' operation every day for 25 years and eight hours a day for the past two years. Of course, the maintenance engineers deserve a goodly portion of the credit for the excellent condition in which they have kept the entire equipment. Such are the results obtained from a regular schedule of maintenance and cleaning.

How the Electrical Industry

—for Domestic Electric Fans. *Steel and brass are the predominant raw materials used in the fan*

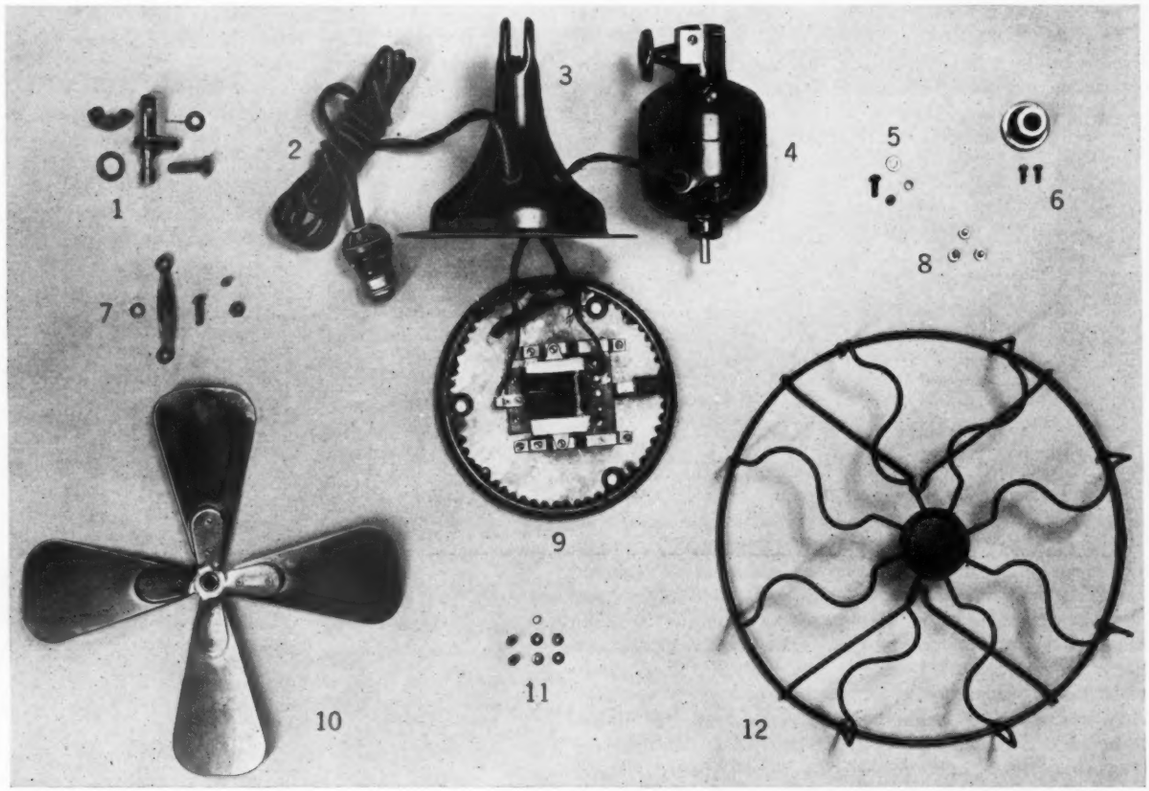
Part No.	Description	Material	Annual Production
1	Motor supporting arm, bolt, wing nut	Steel	781,858
	Wing nut washer	Steel	781,858
	Supporting arm washer	Fibre	781,858
2	Extension cord and plug		781,858
3	Fan standard	Steel	781,858
4	Fan motor and oscillating gears		781,858
5	Motor support piece set screw	Steel	781,858
	Oscillating disc bolt	Steel	781,858
	Oscillating disc bolt sleeve	Brass	781,858
	Oscillating disc bolt washer	Steel	781,858
6	Motor support piece	Steel	781,858
	Motor support piece screws	Steel	1,563,716
7	Oscillating arm bolt nut	Steel	781,858
	Oscillating arm bolt sleeve	Brass	781,858
	Oscillating arm bolt washer	Steel	781,858
8	Base screws	Steel	2,345,574
9	Base disc	Sheet steel	781,858
	Disc covering	Felt	781,858
	Disc covering ring	Steel	781,858
	Resistance unit and switching mechanism		781,858
10	Fan blades	Brass	3,127,432
11	Guard nuts	Brass	1,563,716
	Guard washers	Steel	3,127,432
	Fan blades set screw	Brass	781,858
12	Guard	Steel	781,858

Are you making any of the parts used in domestic electric fans?

If so, you will be interested to know that

781,858

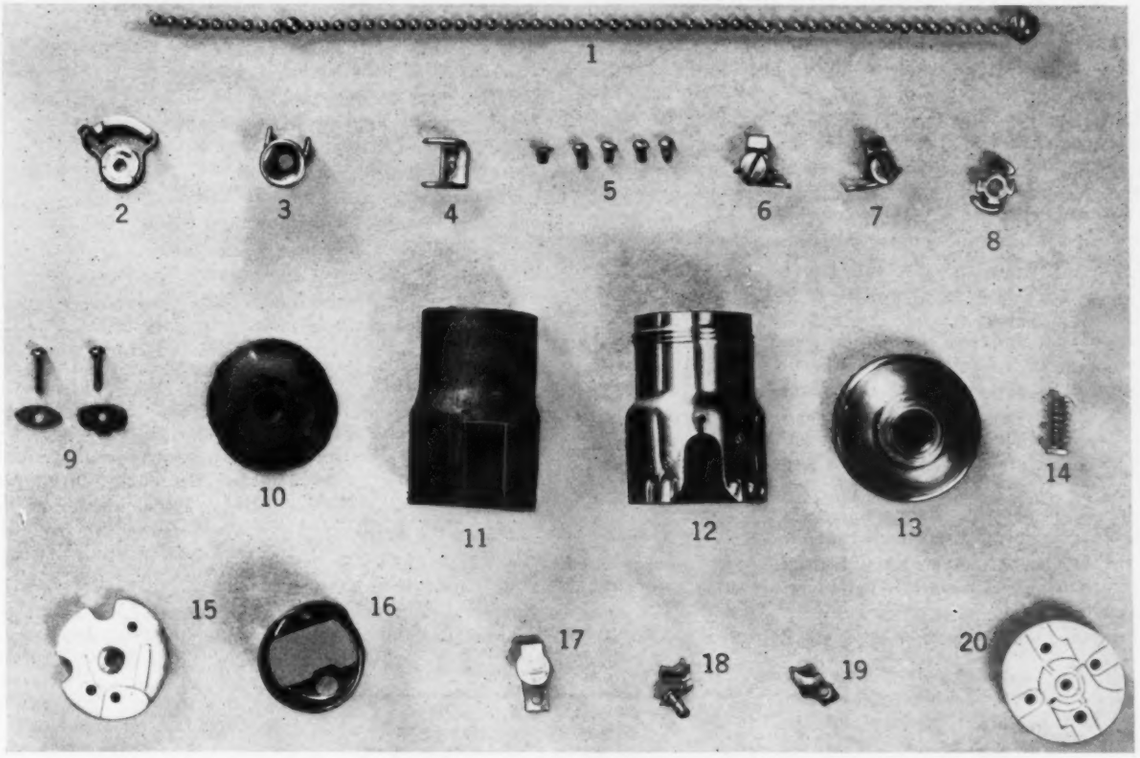
fans were produced in 1925.



Electrical Manufacturing acknowledges the assistance of the Ideal Service Company, Inc., 57 Walker St., New York City, in the preparation of the illustration of the fan parts. The figures shown in the fourth column of the table above are based on the figure of 781,858, the total number of fans produced during 1925

Uses Raw Materials and Parts

—for Sockets. *Fibre, brass and copper are the principal materials needed in socket construction*



The total number of sockets produced in 1925, according to the Department of Commerce Bureau of Statistics was 108,117,878. The figures on total annual production, shown in the fourth column of the table below, are based on this figure with the assumption that all of these sockets were of the pull-chain type. This, of course, introduces an error for some of the parts, but for the majorty of them it is as correct as possible

Are you supplying your share of the raw materials and parts required for the total annual production of

108,117,878

sockets, the figure on this item for 1925?

Part No.	Description	Material	Annual Production
1	Chain	Brass	108,117,878
2	Chain holder	Brass, steel, fibre	108,117,878
3	Chain guide	Brass	108,117,878
4	Chain guide holder	Brass	108,117,878
5	Screws	Brass	540,589,390
6	Wiring contact	Brass	108,117,878
	Wiring contact screw	Brass	108,117,878
7	Wiring contact	Tinned brass	108,117,878
	Wiring contact screw	Tinned brass	108,117,878
8	Rotating switch contact	Copper	108,117,878
9	Socket base holding screws	Brass	216,235,756
	1st washer	Brass	108,117,878
	2nd washer	Fibre	108,117,878
10	Insulating cap	Fibre	108,117,878
11	Insulating shell	Fibre	108,117,878
12	Outer shell	Brass	108,117,878
13	Top cap	Brass	108,117,878
14	Switch shaft	Brass	108,117,878
	Switch shaft spring	Steel	108,117,878
15	Top body part	Porcelain	108,117,878
16	Socket base	Copper	108,117,878
17	Bottom socket contact	Copper	108,117,878
18	Stationary contact with rivet	Copper	108,117,878
19	Stationary contact	Copper	108,117,878
20	Bottom body part	Porcelain	108,117,878

The New Competition Must Be Controlled

(*Continued from page* 4)

fears and shames. Business has too long tolerated the bartering of its integrity for apparent peace. Too often it has had to accept petty tyranny and ignorance when what it needed was intelligent regulation. It has had to tolerate these because it was too often doubtful of itself. Business must stop apologizing for itself by cleaning its own house; let it base its right to exist on its duty to provide the utmost in well-being for all the people.

Let business deal honestly and fearlessly with its own offenses and offenders. Let it expect and receive from the government only the highest ideals of public service—and welcome sincerely the cooperative economic intelligence and guidance which the government has to offer.

What American business most needs now is a new Magna Charta—a declaration of its rights—and a summons to its duties. May I respectfully suggest some clauses for such a Magna Charta?

Business is an economic institution organized for the purpose of providing the nation with the maximum of goods, of leisure and well-being, with the minimum of effort. Its problems are economic and can not be solved by legal or political means unless they are based upon sound economic principles and administered by those who understand these principles.

Business has a right to free activity without hindrances, so long as it achieves its economic purpose. It must be free from the burden of unnecessary legislation and litigation and from harassing by officials with motives other than the public welfare.

Any method of production or system of distribution is legitimate as long as it is economically sound and does not involve unfair practices. Competitive methods which misuse legislation or legal action to handicap the proper development of any system of production or distribution are economically unsound and to be condemned.

It is the duty of business so to conduct itself that its actions can at all times undergo public scrutiny with honor.

It is the right of business, on the other hand, to reserve for itself privacy as a protective competitive measure, and on the other hand to influence the public in its favor by any available means, so long as it uses only the truth; so long as adequate means are available to all elements, and so long as those means remain uncorrupted and incorruptible.

It is the duty of business to clean its own house, and it has the right to expect the utmost in cooperation from the public and the government. But it is the duty of the government when business fails in its duty to devise sound economic measures for regulation and to enforce them with its police power and without fear or favor.

Such rights and duties can not exist in an atmosphere of petty political intrigue or under an antiquated jumble of legal restrictions. Business can not keep up with the new competition so long as the laws which regulate business do not keep up with the new competition. Business cannot live and perform its economic duties to the nation when it must fear and attempt to conform to principles devised economic aeons ago and which have since been confused and distorted by economic ignorance and misunderstanding. The new competition demands a new economic statesmanship.

Business Men Taking Up Slack

(*Continued from page* 13)

ever, there is now more general economic cooperation between manufacturers that has resulted in the organization of the Cotton Textile Institute, the Wool Institute and plans for similar joint endeavors by the carpet and the upholstery manufacturers.

The metal working industries have done considerable more new plant construction and new equipment buying, a condition which characterizes nearly all of the production industries of the country, and efficiency of operation is generally conceded to be a trifle better than last year.

In the mercantile field the volume of trade is slightly ahead of 1927, but bad spots are reported in the coal regions and western farm states. Department store stocks are reported to be somewhat smaller, and in some sections customers are complaining that stores are chronically "just out." Chain dry goods stores are making steady growth, as is group buying by independent department stores. Both chain department stores and those independently operated are credited with normal business because of excellent sales efforts.

The furniture industry in both the manufacturing and merchandising fields is slightly above the level for the first half of 1927. Whether or not the public accepts Art Moderne, furniture styles will have a very decided effect upon business in the fall.

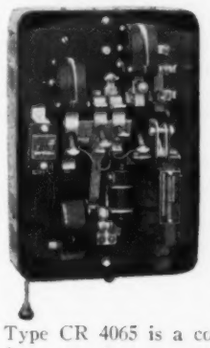
The oil industry is stabilizing its operations to bring crude oil production more nearly in line with the demand for refined products. A marked decrease in oil operations in all but newly opened fields has resulted. Crude oil prices are practically the same as the close of 1927, with no material changes anticipated. Stocks of both crude and refined products have been increased, but at a lesser rate than 1927, and the present supply and demand seems to about balance. Holding runs of crude oil to market demand has resulted in a two-cent advance in the wholesale gasoline price, but the retail price has not been advanced the country over.

Due to a serious over-built situation, particularly in the larger cities, hotels are depressed and price cutting has appeared. It is predicted that many big city hotels will fail before the end of the year. In the ice cream industry, another service industry, costs have increased, due to competitive conditions, and margins of profit will probably be reduced. Despite this, the industry is normal and an increasing number of consolidations are anticipated. Bakers the country over are having normal business and are turning to cake making as the chief field open to them for permanent expansion. The volume of service rendered by hospitals was uniformly larger the first half of this year than last. Industrial and automobile accidents are steadily increasing.

New Goods—for Your Inspection

A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

D.C. Motor Starters



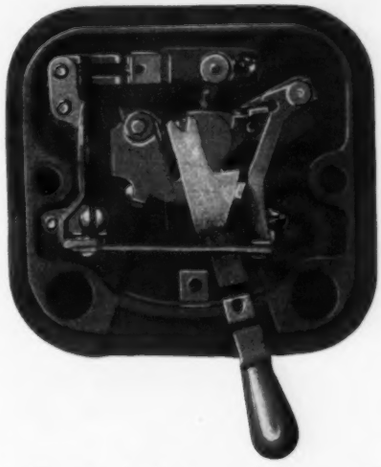
General Electric Co., Schenectady, N. Y., has brought out a line of D.C. motor starters for general purpose applications. These starters are designed to provide definite time acceleration for constant and adjustable speed motors and are divided into five types. Type CR 4065 is a constant speed starter for general purpose applications and CR 4066 is the same, with the addition of dynamic braking. Type CR 4166 (illustrated) is an adjustable speed starter with dynamic braking and full field features. Type CR 4068 is a constant speed starter, reversing, with dynamic braking. Type 4168 is an adjustable speed starter, reversing, with dynamic braking and full field features. On the starters provided with dynamic braking,, a small relay is used to prevent the solenoid from being reenergized before the motor has come to rest. Thermal overload protection is provided by means of single coil relays, having a thermal capacity to stand high inrush currents.

Braidite Wire

Cornish Wire Co., 30 Church St., New York City, has added Braidite hook-up wire to its line of copper wire. The insulation is designed to be scorch proof and not to unravel. It is made either solid or stranded in the following colors: red, green, yellow, blue or black.

Sentinel Breaker

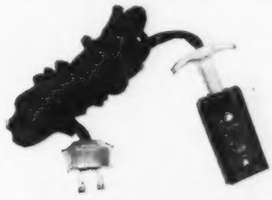
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is marketing an overload protective device for domestic use known as the Sentinel Breaker. It is designed to protect all domestic appliances, such as clothes washers, ironers, electric refrigerators, oil burners, and pumps and compressors. The breaker will trip when it is subjected to prolonged overloads, but will not operate as the result of a momentary overload. When tripped, the breaker cannot be reset until the injurious overload is removed. The switch case is of moisture-proof molded composition, and the only exposed moving part is the operating handle at the bottom of the case. The breaker will operate on any make of motor on either 110 or 220 volt, 25, 30, 50



or 60 cycle, single phase A.C., or on 32, 115 or 230 volt D.C. circuits. Eight different current ratings for each of the commercial voltages and frequencies make it possible for the breaker to be used with any motor from 1/20 to 1 hp.

Kool-Pull Plug

Colt's Patent Fire Arms Mfg. Co., 17 Van Dyke Ave., Hartford, Conn., is marketing a Kool-Pull attachment plug which is designed with a pull-out handle feature



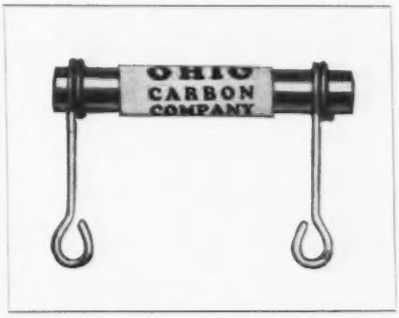
to eliminate the temptation to yank out the plug by the cord, thus loosening the connections and creating a short circuit hazard. When the handle is used, no strain at all comes on the connections. The handle is rigid and is attached to the plug by means of a pivot joint which makes the pull-out easy from almost any angle. The plug outfits are made in four styles: Kool-Pull Cord Set (illustrated); Kool-Pull Cord Set with Switch; Kool-Pull Attachment Plug, and Kool-Pull Attachment Plug with Switch.

Cord Grip Pull Cap

Cutler - Hammer Mfg. Co., 12th and St. Paul Ave., Milwaukee, Wis., is marketing unbreakable attachment plug cap, Catalog No. 7784, with improved type of cord grip. The cord grip is designed as a strain relief to lessen the hazard of short circuits. The knurled collar wedges a fiber bushing tightly against the cord. The parts are designed to cause a natural pressure from the inside which will prevent loosening of the knurled collar and insure that a firm grip is maintained at all times. A fiber grip bushing serves to insulate the cord from metals parts, at the same time acting as a clamp. The cap has an armored shell of heavy brass which is designed to be rustproof and unbreakable. Sheet bakelite is used to hold the blades in place. These attachment plug caps are finished either in bakelite brown or zinc gray.

Carbon Grid Leaks

Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio, has brought out a line of carbon grid leaks and resistors with the wire terminal, illustrated, and with the standard ferrule cap terminal. They are

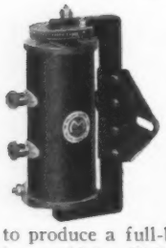


supplied in ranges from 200 ohms to 10 megohms. They are designed to be non-inductive, non-hygroscopic, to have a low temperature coefficient and to be unaffected by normal temperature changes.

Perfecto Soldering Flux

Firth Radio Corp., 25 Beaver St., New York, has placed on the market the Perfecto soldering fluid No. 4 for use in soldering nickel-chromium alloys. This flux is non-acid and is designed to be non-corrosive and not injurious to the skin. According to the manufacturer, it has been endorsed by the Driver-Harris Co. and the Gilby Wire Co. for use in soldering the nickel-chromium alloy wire made by these companies.

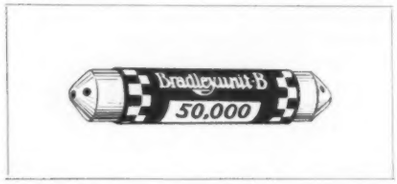
Master Coil



Mallory Electric Corp., Toledo, Ohio, has brought out the Mallory Master Coil, Type C-3, designed for use in the ignition system for all 4, 6 and 8 cylinder, high speed and high compression engines. It is designed to produce a full-bodied spark of immense heat, which will jump a 3/16 in. spark gap from one cell of the battery. It is said to be able to fire through the highest compression engines, oxidized distributor segments and spark plug points without losing its heat.

Radio Resistor

Allen-Bradley Co., 286 Greenfield Ave., Milwaukee, Wis., has added to its line of radio resistance units the Bradleyunit-B, a fixed resistor for use as a grid leak or other fixed resistance in radio circuits.



It is made of a special preparation, baked and solid-molded at high pressure, and is designed to be weatherproof and to have a constant resistance regardless of the voltage employed. It is furnished with or without tinned copper leads in units of from 500 ohms to 10 megohms.

Color Karolith

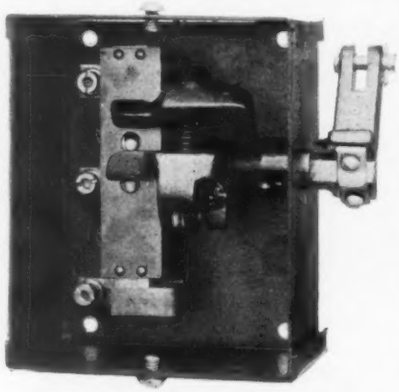
Karolith Corp., 189 13th St., Long Island City, N. Y., announces that its Karolith molding service is now available for making all kinds and sizes of molded parts in all colors. Karolith in colors will be furnished to manufacturers in rod, tube and sheet form.

Impregnating Compound

American Tar Products Co., Pittsburgh, is marketing Hexsulate, an impregnating compound. It is said to be sufficiently liquid for perfect impregnation at low temperatures, to have high dielectric strength, to be impervious to weather, to have unusual ductility, to be fungus and microbe resisting and not to be tacky or sticky.

Master Switch

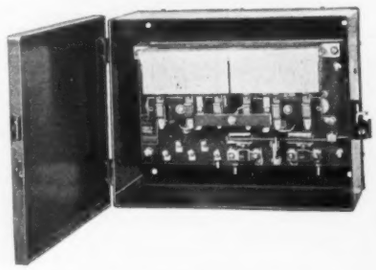
Cutler-Hammer Mfg. Co., 12th & St. Paul Ave., Milwaukee, Wis., has brought out a master switch, designed for splined shaft or shipper rod operation. It is for use as a pilot circuit control device on lathes, textile machinery and other equipment where starting and stopping of the machine is to be governed by splined shaft, shipper rod or similar device. Should the motor stop due to low voltage or for any other reason, it cannot be started again until the switch has been re-set. Outstanding features of the switch are: Non-stubbing contacts; shear pin to protect mechanism; few parts and simple construction; operating lever can be placed in any one of four operating positions, 90 degrees apart; long steel-to-bronze main bearing with oil hole; small size; fully



inclosed in heavy steel case; and cover can be removed by loosening only two screws. The switch is designed especially for three wire control, but can also be used for two wire control on pilot circuits up to 550 volts.

Automatic Starter

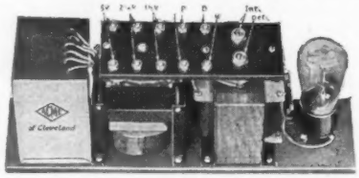
Industrial Controller Co., Milwaukee, Wis., has brought out an A.C. automatic across-the-line starter, Class 8732. It incorporates the following features: Push



button control, low voltage protection, time limit overload, thermal relays, three pole, two or three wire control, contactors mechanically interlocked, and the unit fully inclosed.

Power Pack

Acme Electric & Mfg. Co., 1444 Hamilton Ave., Cleveland, Ohio, is marketing power pack, Model ABC. It delivers 40 milliamperes at 180 volts and uses a full wave UX-280 or CX-380 filament type tube, and the filter circuit employed is the



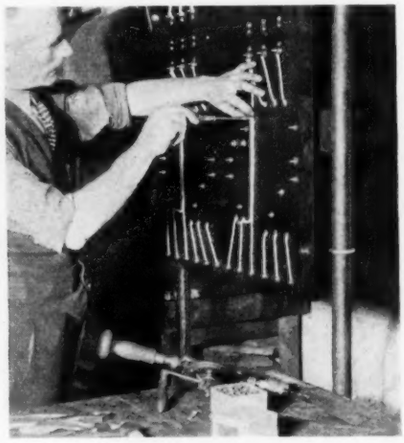
double brute force type. It is designed to supply any set using D.C. tubes and make the set completely socket-power operated. It operates on 110-115 volts, 50-60 cycles. The dimensions of the pack are: Width, 3 in.; length, 12 in.; height, 5¼ in.

Tip Jack

H. H. Eby Mfg. Co., 4710 Stenton Ave., Philadelphia, has brought out a tip jack suitable for general and specific use on metal and insulated baseboards and panels. It is designed with a countersunk head in order to afford special support to the shank of the cord tip and to provide greater rigidity when the tip is plugged into the jack. Double-spring contact is used to counteract small discrepancies in the diameter of cord tips, and to provide more perfect contact. Each tip is equipped with two special insulating washers, permitting the use of the jack on metal panels and baseboards. The tip jack connecting lug is an integral portion of the contact springs and is soldered into place. Each tip jack is provided with a color code washer—black and red making a pair—to facilitate wiring into the circuit and to expedite determination of polarity when in the circuit.

Steel Metal Screw

Parker-Kalon Corp., 190 Varick St., New York City, is marketing a line of hardened self-tapping sheet metal screws. These are steel and have either rounded or flat heads. They are threaded and



hardened in such a way as to enable them to cut into sheet metal without stripping their threads. They are designed for use in punched or drilled holes in sheet metal. The screws are furnished in six different sizes.

Grid Leak

Polymet Mfg. Co., 599 Broadway, New York City, is marketing a metallized grid leak with pigtail soldering connections, having developed a method for making a

positive contact between the resistance element and the external soldering connection. The grid leak can now be soldered directly into the circuit without the need of a bakelite mounting.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of **ELECTRICAL MANUFACTURING** is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore. This Classified Index has been an exclusive **ELECTRICAL RECORD** feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
AMMETERS. See Instruments.
ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature.
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.
ARMORING MACHINES. See Wire Manufacturing Machines.
ARMS, FLEXIBLE. See Tubing Flexible Metallic.
ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville, Inc., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Deceleco, Inc., Wayne, Mich.
Federal Insulating Corp., Yonkers, N. Y.
Johns-Manville, Inc., New York, N. Y.
Transite. See Johns-Manville, Inc
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines)
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines)
BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.
BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.
BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.

Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Newcomb Mfg. Co., F. J., 42 West 13th St., New York.
Old Colony Iron Wks., Bridgeport, Conn.
Pittsburgh Valve & Fittings Co., Barberton, Ohio. (Cast Iron.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.
BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Braun Bearings Co., Primos, Pa.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 184 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, 141 Frelinghuysen Ave., Newark, N. J.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Arguto Oilless Bearings Co., Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Mechanical Devices Co., Aurora, Ill.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. P. B. See Mechanical Devices Co.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
P. O. B. See Mechanical Devices Co.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
More-Jones Brass & Metal Co., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.
BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.
BLUESTONE. See Chemicals, Battery.

BOARD, Filler. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago,

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago,
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Dept. 36, 111 W. Washington Chicago, Ill.
Garr Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 309 Decatur, Sandusky, Ohio. (Wrappers.)
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.
BRAIDING MACHINES. See Wire Manufacturing Machines.
BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Brass Co., Baltimore, Md.
Baltimore Copper Smelting & Rolling Co., Baltimore, Md.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo.								H
B. B. B. See Becker Bros. Elec'l Corp.								
Baylis Co., Bloomfield, N. J.								H
Becker Bros. Elec'l. Corp., 25 N. Jefferson, Chicago, Ill.	C	W	S	H	L			
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.	C							
Boston Woven Wire Brush Co., Northboro, Mass.		W						
Boxill-Bruel Carbon Co., Columbus Park, O.	C							H
Caiebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.	C							
Carbon Engrg. Co., Slinger, Wis.	C							L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O.	C							
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y.	C							
Carenco. See Carbon Engineering Co.								
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y.	C	W	S					L
Columbia Machine Wks., & M. I. Co., 263 Chestnut, Brooklyn, N. Y.								H
Cooley Mfg. Co., 98 Park Place, New York		W						
Diamond C. See Chapin Co., Chas. E.								
Dixon Crucible Co., Joseph, Jersey City.								
Electra. See Automotive Mfg. Co.								
Electric Accessories Co., 310 York Ave., Philadelphia, Pa.								H
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa.								
Eureka Copper Products Corp., North East, Pa.		W	S	H				
Fleck Carbon Co., 508 Broome, New York	C							
General Electric Co., Schenectady, N. Y.	C							H L
Graphalloy. See Graphite Metallising Corp.								
Graphite Metalizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y.	C							H
Henrite Products Co., 98 Park Place, New York, N. Y.	C							
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio								H
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.)	C							
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa.	C							

BRUSHES, Commutator—Continued
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C . . . . . .
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y. C . . . . . .
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C . . . . . .
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C . . . . . .
National Carbon Co., Cleveland, O. ..... C . . . . . .
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. ..... W . . . . .
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C . . . . . .
Pure Carbon Co., Wellsville, N. Y. ..... C W S . . L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... W L
Salem Electrical Supply Co., Salem, Mass. .. W . . . . .
Seabury, Ralph L., Factories Bldg., Toledo, O. C . . . . . .
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C . . . . . .
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C . . . . . .
Stackpole Carbon Co., St. Mary's, Pa. .... C . . . . . .
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C . . . . . .
U. S. Graphite Co., Saginaw, Mich. ..... C . . . . . .
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill. ..... C . . . . . .
Universal. See Graphite Metalizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.
BUSHINGS, SHAFT. See Bearings and Bushings.
CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeels, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Resloh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
States Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schroyer Ave. Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 144 Bleecker, Newark.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Crescent Chair Co., Plymouth, Wis.
Delker Co., Geo., Henderson, Ky.

Die Castings

Aluminum, Tin, Lead and White Brass, Special Machines, Dies, Tools, Jigs and Stampings

Advance Tool & Die Casting Co.
1654-60 Holton St., Milwaukee, Wis.
Edgewood 284

Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
King Mfg. Corp., Hano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
National Cabinet Co., New Philadelphia, O.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Ottawa Furniture Co., Holland, Mich.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pilliled Lumber Co., Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo.
West Box Co., 235 Liberty, Springfield, Mass.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines.
CABLE TEST SETS. See Instruments, Portable and Switchboard.
CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., Wilmington, Del.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh, Pa.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
McGill Metal Co., Valparaiso, Ind.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.
Sterling Art Metal Wks., 61 Grand, New York, N. Y.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.

Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Olive Bldg., Pittsburgh.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., S. 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Chandelier (Fancy). See Crystals, Chandeliers.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
McKinnon Chain Co., Tonawanda, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

American High Speed Chain Co., 221 E. South, Indianapolis.
Baldwin Chain & Mfg. Co., Worcester, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.

CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Glidden Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 833 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.

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Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.

CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros Co., Piano, Ill.

CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH UNTREATED

Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill. (Cotton Duck)

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) .... See B
Silk ..... See S

Acme Wire Co., New Haven, Conn..... C S P . . .
Armatite. See Mica Insulator Co.
Brand & Co., Wm., 268 Fourth Ave., New York ..... P . . .
Campbellite. See Campbell Fibre Co.
Campbell Fibre Co., Stanton, Delaware..... B
Carboloid Products Corp., 15 Park Row, New York, N. Y..... C . . P . . .
Case Brothers, Inc., Highland Park, Conn.. . . . . B
Case & Risley Press Paper Co., Oneco, Conn. . . . . .
C-F. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa..... P F B
Chicago Mica Co., Valparaiso, Ind..... C . . . . . .
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Diamond State Fibre Co., Bridgeport, Pa.. . . . P . . .
Dielectric Mfg. Co., St. Louis, Mo..... C S P . . B
Federal Insulating Corp., Yonkers, N. Y... C . . P F . .
General Electric Co., Schenectady, N. Y.... C . . P . . .
Hewitt & Bros., C. B., 16 Ferry, New York C . . P . . .
Hi-Tex. See Stevens Paper Mills.
Incella. See Tarentum Paper Mills Co.
Irvington Varnish & Insulator Co., Irvington, N. J. ..... C S P . . .
Manning Paper Co., J. A., Troy, N. Y..... B
Mica Insulating Co., 200 Varick, New York C S P . . B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. ..... P . . .
National Vulcanized Fibre Co., Wilmington, Del. ..... F . .
New Jersey Wood Finishing Co., Woodbridge, N. J. ..... C . . . . . .
Ohmoid. See Wilmington Fibre Specialty Co.
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass. . . . . F . .
Rogers Paper Mfg. Co., South Manchester, Conn. ..... B
Schweitzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Scutan Co., 342 Madison Ave., New York . . . . P . . .
Sico. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y.. . . . . F . .
Standard Insulation Co., Rutherford, N. J. C S P . . .
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varised Hard Fibreboard)..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn..... B
Tarentum Paper Mills Co., Tarentum, Pa.. . . . P . . .
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. . . . P . . .
West Virginia Pulp & Paper Co., 200 5th Ave., New York..... B
Wilmington Fibre Specialty Co., Wilmington, Del. ..... P . . .

CLUTCHES, Magnetic

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished

Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., 22 Elkins (South Boston), Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Coilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 27th & Sanderson Sts., Camden, N. J.
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.

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Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 8 Centre, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Sevison Magneto Engrg. Co., 397 Phillips, Toledo, O.
Stunz & Barron, 210 E. Pratt, Baltimore, Md.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR

Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS

Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor

Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-G Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 2698 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 292 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Slauson Ave., Los Angeles.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreoil. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 319 W. Ohio, Chicago, Ill.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Mfg. Co., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 368 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS

Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Baumbach Mfg. Co., 1810 S. Kilbourn Ave., Chicago, Ill.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., Newark, N. J.
Roselle Mfg. Co., 215 E. 9th Ave., Roselle, N. J.
Schwenke Machine Engraving Co., 3036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati.
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel

EYELETS

Platt Bros. & Co., Waterbury, Conn.

FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT

Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

FERRULES

Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)

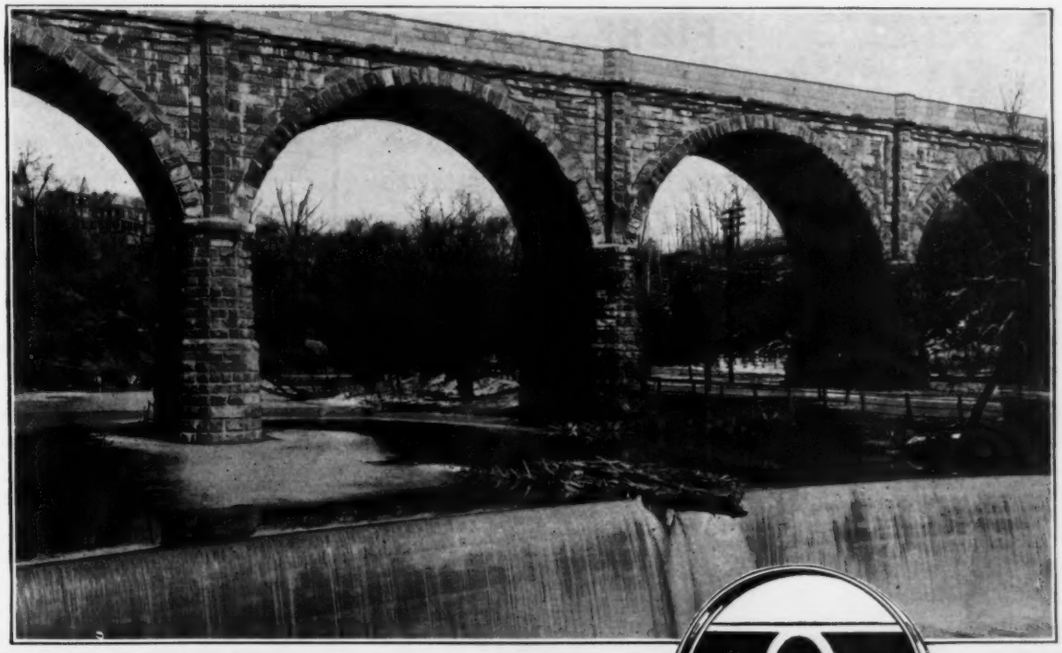
Container Corp. of America, 111 W. Washington, Dept. 38, Chicago, Ill.
Mid-West Box Co., Dept. 6, 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.

FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Dureste. See Spaulding Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 423 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.



The high-arched railroad bridge over the Wissahickon Creek, Philadelphia, has the same fine attributes of quality, strength and RESISTANCE to shock and vibration so typical of Mid-West Corrugated boxes. One of our largest plants, making Solid Fibre and Corrugated products, is located near this bridge. (Photo Reading R.R.)

The Mid-West Box is Strengthened by the Arch in the same way as a Bridge

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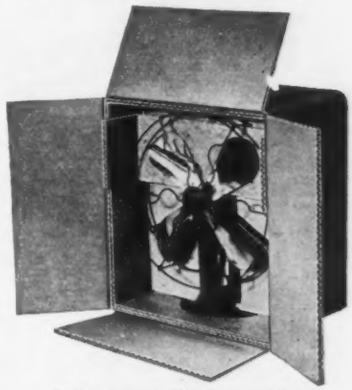
The Solid Fibre boxes of the Container Corporation of America contain every good feature desired by careful shippers. The fifteen mills and box factories of both companies offer prompt service, short hauls and superior, always dependable products.

Let us serve you. Fill in and mail coupon, without obligation of any kind. Start to economize NOW.



High, strong resilient corrugations form a powerful wall of resistance and defence against transportation abuses.

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CONTAINER CORPORATION
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111 W. Washington St. CHICAGO, ILLINOIS

Six Mills — Nine Factories Capacity 1200 tons per day

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MID-WEST BOX COMPANY
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Name _____

Title _____

Firm _____

Address _____

Fibre, Phenol—Continued
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Agasote Millboard Co. (Fernwood), Trenton, N. J.
Brandywine Fibre Products Co., North Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibre Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 14th and Willow Ave., Hoboken, N. J.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark.
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1264 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Cellars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps . . . . . H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) . . . . . B . . . .
American Pin Co., Waterbury, Conn. . . . . I . . .
American Ring Co., Waterbury, Conn. (Candle.) . . . S . .
Ampinco. See American Pin Co.
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. . . . . B I . . .
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn . . . . . S . .
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit . . B . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York . . . . . B . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . .
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) . . . . . B I . . .
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) . . . . . B I . . H
Cambridge Brass Co., Cambridge, Mass. . . . . B . . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. . . . . B . . S . .
Crescent Brass Mfg. Co., Reading, Pa. . . . . B . . . .
Crouse-Hinds, Solvay Sts., Syracuse, N. Y. . . . . S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) . . . . . B I . . .
Dunlap Co., John, Carnegie, Pa. . . . . S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. . . . . B . . . .
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. . . . . B I S H
Fisherty Co., M. E., 38 S. Clinton, Chicago . . . I . . .
Fralick Co., S. R., 15 S. Clinton, Chicago . . . I . . .
Franklin Brass Foundry Co., Reading, Pa. . . . B . . . .
Friedley-Voshardt Co., Chicago . . . . . B . . . .
Full-O-Lite Co., 50 Dey, New York, N. Y. . . . . B . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. . . . . I . . .
Hart & Hegeman Mfg. Co., Hartford, Conn. . . . . S . .
Incandescent Supply Co., 468 West Broadway, New York, N. Y. . . . . B . . . H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 228 Jelliff Ave., Newark, N. J. (Cross Bar.) . . . . . I . . .
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y. . . . . I . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. . . . . B I . . .
Liberty Machine Co., Wauwatosa, Wis. . . . . B I . . .
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. . . . . H
L. & W. Brass Wks., 820 Orleans, Chicago, Ill. B . . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. . . . . I . . .
Macallen Co., Foundry St., Boston, Mass. . . . . I . . .
Metal Products Co., 210 Canal, New York . . . B . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. . . . . I . . .

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Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. . . . . B . . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. . . I . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. . . . . B . . . . .
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. . . . . S . .
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. . . . . B I . . .
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) . . . . . I . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. . . . . H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. . . . . B . . . . .
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. . . . . I . . .
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B . . S . .
Peerless Products Line, 5612 First Ave., Baltimore, Md. . . . . B . . . H
Perfeclite Co., 1457 E. 40th, Cleveland . . . . . S . .
Pittsburgh Valve & Fittings Co., Barberton, O. . . I . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. B I . . .
Rodale Mfg. Co., 200 Hudson, New York . . . . B . . . H
Sandow Tool Co., 1440 Bway, New York, N. Y. . . . S . .
Scovill Mfg. Co., Waterbury, Conn. . . . . B I . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors) . . . . . B . . . . .
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. B . . . . .
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. . . . . S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. . . . . B . . . . .
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. . . . . I . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S . .
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) . . . . . B . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y. . . . . B . . . . .
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York . . . . I . . .
Triumph Mfg. Co., 310-13, West New York, N. J. . . . . S . .
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. . . . . B . . . . .
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B . . . . .
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. . . . . B . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. . . . . B . . . .
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. . . . . B . . . .
Waterbury Mfg. Co., Waterbury, Conn. . . . . B . . S . .
Waterbury Metal Wares Co., Waterbury, Conn. . . . S . .
Weber Brass Co., Whitney Power Block, Cleveland, O. . . . . B . . . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. . . . . B . . S . .
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. . . . . B . . . . .
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 706 Russia, San Francisco, Cal.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flin-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.

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119 W. Ohio St., Pittsburgh, Pa.

General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jewel Elec. & Mfg. Co., 4505 Ravenswood Ave., Chicago, Ill.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2622 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

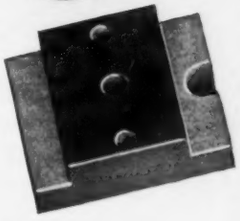
FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.

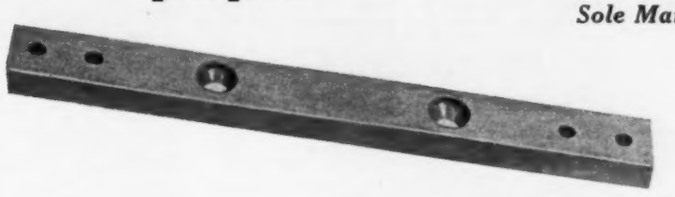
FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. . . . . P . . . . .
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn. . . . . P N . . .
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. . . . . P . . . . .
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis . . . . . C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass. . . . C P N R O
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th St., Chicago, Ill. . . . . C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) . . . . . C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh . . . . . C . . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va. . C P N R . .
Elliott Electric Co., Shreveport, La. . . . . .
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y. . . . . C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. . . . . C . . . R . .
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. . . P . . R . .
Hudson Wire Co., Ossining, N. Y. . . . . O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. . . . . C P N . . O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. . . . . C . . . . . .
Merrill Mfg. Co., 40 State, Boston, Mass. . . . . .
Monarch Fuse Co., Jamestown, N. Y. . . . . C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. . . . . C P . . R . .
Platt Bros. & Co., Waterbury, Conn. . . . . O
Powell, F. W., 119 W. Ohio, Pittsburgh . . . P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass. . C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. . . . . C . . . R . .
Royal Elec. Co., Chelsea Station, Boston . . . P N . . .
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee . . . . . C P N R . .
Union. See Chicago-Jefferson Fuse & Electric





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Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.
GALVANOMETERS. See Instruments, Laboratory Standard.

GAS INERT
Helium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Axe., New York, N. Y.

GASKETS, Rubber
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.
GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS (Speed Changing Units)
Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Heil-Spur. See Horsburgh & Scott.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm
Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition
Celoron Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co., Bridgeport, Pa.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 315 N. Curtis, Chicago.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.
GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes
Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE
Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Berylite. See Plaut & Co., L.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gleteco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kauffeld Glass & Ceramic Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Melilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.

Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearitone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestepal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells
Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.
GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons
Allen, Chas. E., Pequabuck, Conn.
American Ename' Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.
HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
ICE CREAM CABINETS. See Refrigerator Cabinets.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation
Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.
INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Oslso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket
Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.

Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard
This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.
See Also Instruments, Pocket; Also Instruments, Laboratory Standard.
Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
Jaynes, R. F., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn N. Y.
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Elsemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co. Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.
INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co., Saginaw, Mich.
INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Rodefer Glass Co., Bellaire, O.
Smeath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing
Bird, Richard H., Waltham, Mass.
Dekastel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.

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Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

JOINTS, Fixture Insulating
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer. Metal. See Paint, Varnish and Lacquer.

LAMINATIONS. See Discs, Armature.

LAMP BASES. See Bases, Reading Lamp.

LAMP BULBS (Unfinished). See Bulbs, Glass.

LAMP FILAMENTS. See Filaments, Incandescent Lamp.

LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.

LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

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(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
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Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.

LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Lights Co., 30 W. 15th, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill.
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.

LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

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Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Double Duty. See Aristocrat Corp. of America.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 42nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 55½ Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill
Lata Balsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products, 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radioceive. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Pressed Steel & Mfg. Co., Newton, Mass.
O'Neil Mfg. Co., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Puropower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place. New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Ralitotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swcboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Vitalitone Radio Corp., 88 University Place, New York.
Wonderphone. See Universal High-Power Telephone Co.
Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper
Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

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KEY

Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S ..
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C .. P
Reynolds Spring Co., Jackson, Mich..... S ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. ..... C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES
Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.

Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making
For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Elsler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.

MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.

MAGNET CHARGERS. See Chargers, Magnet.

MAGNET STEEL. See Steel, Magnet.

MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.

MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.

MAGNETIC CHUCKS. See Chucks, Magnetic.

MAGNETIC CLUTCHES. See Clutches, Magnetic.

MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent
Bulleau Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New

MANGANESE, Battery. See Chemicals, Battery.

MEASURING INSTRUMENTS. See Instruments.

MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.

MEGOHMMETERS. See Instruments, Laboratory Standard.

MERCURY SWITCHES. See Switches, Mercury.

METAL CLEANERS (Compound). See Cleaners, Metal.

METAL CUTTING OUTFITS. See Welding and Cutting Outfits.

METAL FINISHING. See Plating & Finishing.

METAL MARKING OUTFITS. See Engraving Machines.

METALLIC SHADES. See Shades, Metallic.

METERS. See Instruments.

MICA SHADES. See Shades, Mica.

MICA TAPE. See Tape, Mica.

MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA
Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 154 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals Co., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K, 804 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Norra Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

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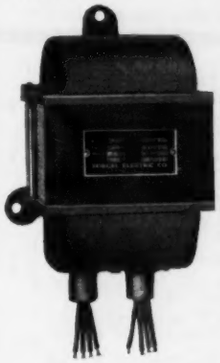

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MIXERS, INSULATION. See Insulation Mixers.

MOLDED
Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION

Aico. See American Insulator Corp.
Alden Mfg. Co., Brockton, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., Graybar Bldg., New York, N. Y.
Amerine. See American Insulator Corp.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1238 St. Paul Ave., Milwaukee,
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimeo. See Dayton Insulating Moulding Co.
Durex. See General Plastics, Inc.
Durite. See Stokes & Smith Co.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 56 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hercules Powder Co., Wilmington, Delaware.
Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 504 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Bellville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Keystone Specialty Co., 2373½ Coventry Rd. (Lakewood), Cleveland, O.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamix. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.

The Chandler Co.
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Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Renite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Elec. & Mfg. Co., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.
Starlite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOLYBDENUM

Elkon Wks. (subsidiary of P. R. Mallory Co.), Portchester, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.

MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches, Snap (Heavy Duty).

MOTORS

Alternating Current .....See S
Direct Current .....See S
Motors, 1 Hp. up .....See M
Motors Fractional Hp. .....See F
Universal .....See U

Ace. See A. C. Dayton Co.
A. C. Dayton Co., 308 E. 1st, Dayton, O..... F S ..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland M .. .. ..
Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Brown Boveri Elec. Corp., Graybar Bldg., New York, N. Y..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
A. R. S. See Westinghouse Elec.
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... F S U
Bogue Elec. Co. Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F .. ..
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 812 Lafayette, Toledo, O..... F .. .. ..
Cah. See Westinghouse Elec. Mfg. Co.
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O..... M .. S ..
Cleveland Elec. Motor Co., 5213 Windsor Ave., Cleveland, O..... M F S ..
Colonial Fan & Motor Co., Warren, O..... M F S U
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cuahman Elec. Co., Concord, N. H..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O..... F S ..
Diehl Mfg. Co., Elizabeth, N. J..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O..... .. .. S U
Dumore. See Wisconsin Elec. Co.
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O..... .. ..
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., Chicago, Ill..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo..... F .. S ..
General Elec. Co., Schenectady, N. Y..... M F S U
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hobart Bros. Co., Troy, O..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O..... M .. S ..
Imperial Electric Co., Akron, O..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago..... .. F S ..
Jantz & Leist Elec. Co., Cincinnati, O..... M F .. ..
Jeanin Electric Co., Toledo, O..... M F S ..
Kan-Dor Elec. Co., 1821 E. 59th, Los Angeles M .. .. ..
Kendrick & Davis Co., Lebanon, N. H..... .. F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M .. S U
King Elec. Co., 35 Murray, New York..... M .. .. U
Knapp Elec. Corp., Portchester, N. Y..... .. F S U
Leland Elec. Co., Dayton, O..... .. F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O..... M .. .. ..
Mando Co., Syracuse, N. Y..... .. F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich..... M .. .. ..
Master Electric Co., Linden and Master Aves., Dayton, O..... M F S ..
MC. See General Electric Co.
Metergram. See Bodine Elec. Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.

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Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio..... .. F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Pan. See Chandeysson Elec. Co.
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Ra-Lite. See Acme Elec. & Mfg. Co.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O..... M .. S ..
Reynolds Electric Co., 2622 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O..... M F S U
Rochester Elec Products Corp., Rochester, N. Y. M .. S ..
Rotator. See Bodine Elec. Co.
Roth Bros. & Co., Chicago, Ill..... M .. S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y..... M F S U
Sturtevant Co., Boston, Mass..... M F S U
Sunlight Electrical Mfg. Co., Warren, O...... .. F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles..... M .. S ..
Usemco. See U. S. Elec Mfg. Co.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O..... M .. S ..
Wisconsin Elec. Co., 59 16th, Racine, Wis.... .. F .. U
Woods Mach. Co., S. A., Boston..... M F S ..
W-P Corp., Cairo, Ill..... .. F S ..
Zobell Elec. Motor Co., Garwood, N. J..... M .. S ..

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Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Celoron Co., Bridgeport, Pa.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Waterbury Button Co., Waterbury, Conn.

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Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.
United States Nickel Co., New Brunswick, N. J.

NOTCHING MACHINES, Armature

Ferracute Machine Co., Bridgeton, N. J.

OHMMETERS. See Istruments, Laboratory Standard; also Instruments, Portable and Switchboard.
OIL-LESS BEARINGS. See Bearings, Oil-less.
OSCILLOSCOPES. See Instruments, Laboratory Standard.

OVENS, Industrial and Laboratory

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Despatch Oven Co., 120 First Ave., N., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas. See Thermo Elec. Instrument Co.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Oven Equipment Co., New Haven, Conn. (Coil Driers.)
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)

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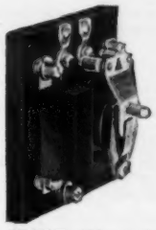

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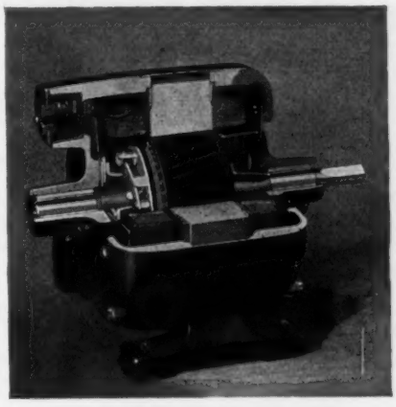

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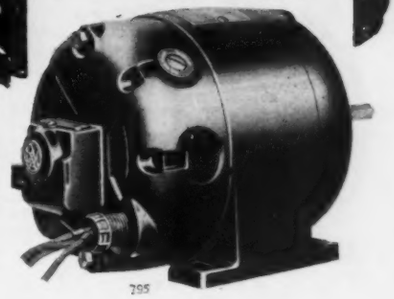

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Acme Wire Co., New Haven, Conn. V
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
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Arolac. See Arizona Lacquer Mfg. Co.
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Chinalac. See Dolph Co., John C.
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Code 25. See Mitchell-Rand Mfg. Co.
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Comulac. See Martindale Elec. Co.
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Du Pont de Nemours & Co., Wilmington, Del.. P
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Eclipse Paint & Mfg. Co., Cleveland, O. ..... P
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Federal Insulating Corp., Yonkers, N. Y..... V P
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General Elec. Co., Mds. Dept. Bridgeport, Conn.. V P
General Plastics, Inc., 56 Walck Rd., N. Tonawanda, N. Y. V
George Co., P. D., St. Louis, Mo. V
G. E. See General Elec. Co.
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H. B. See Maas & Waldstein Co.
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Insulvar. See Varflex Corp.
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Kodalak. See Eastman Kodak Co.
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Linolac. See Mica Insulator Co.
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Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P
Lucote. See Lucas & Co., John.
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McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P
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Mecco. See Henry V. Walker Co.
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M. I. C. See Mica Insulator Co.
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O'Brien Varnish Co., South Bend, Ind. ..... V P L
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Ozite. See Standard Underground Cable Co.
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Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
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Republic Varnish Co., 200 Thomas, Newark, N. J. V
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P
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S. P. C. See Ruberoid Co.
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Sherwin-Williams Co., Cleveland, O. ..... V P L
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Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo. ..... V P
Standard Flexible Comp. Co., Franklin Trust Bldg., Philadelphia, Pa. ..... V P
Standard Insulation Co., Rutherford, N. J..... V
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. V
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. V
2098. See Mitchell-Rand Mfg. Co.
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P
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Zapon Co., Stamford, Conn. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York..... L

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Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber). See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

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Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Elephant Brand. See Phosphor-Bronze Smelting Co.
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Kino-Lamp. See Raytheon Mfg. Co.
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Wire Gauze. See Brushes, Commutator.
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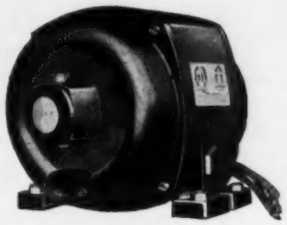

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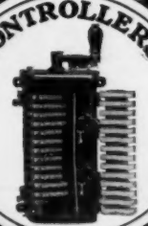

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National Contact Co., 33 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN

Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes

Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Parker, J. H., 296 Broadway, New York, N. Y.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co., Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS

Unglazed earthenware cups for primary (wet) batteries.
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding

Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.

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POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse.
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B., York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding

Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching

Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y.
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition

General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Spruceolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Mechanical Devices Co., Aurora, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Eimer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1829 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., 22 Elkins (S. B.), Boston, Mass.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
All-Henry Coil Co., South Gate, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.

Amsco Products, Inc., 416 Broome, New York. (TRF Kit.)
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Autoformer. See Thordarson Elec. Mfg. Co.
Balcon. See Pacent Electric Co.
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st, New York, N. Y.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Payntar Ave., Long Island City, N. Y.
Buffer. See Aerovox Wireless Corp.
Buffalo. See DeJur Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsior Radio Corp., 226 Grand, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filtatrol. See Amsco Products, Inc.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Ohm. See Carter Radio Co.
Hi-Pet. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Held-Tite. See Carter Radio Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co. 2½ S. 20th, Philadelphia, Pa.
Isodon. See Auburn Button Works.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kilograd. See Pilot Elec. Mfg. Co.
Kroblack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireles Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Corp.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Megzit. See Cole Mfg. Corp.
Megostat. See Pacent Elec. Co.
Melco-Supreme. See Amsco Products, Inc.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.

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"Lily Wilson" Vacuum Cleaner.
"Packard" Vacuum Cleaner.
"Perkins" Siren.
"Wharton" Battery Charger.
"Flint" Waffle Iron.

"Corona" Fireless Cooker, asked for in our June issue, is manufactured by Landers, Frary & Clark, New Britain, Conn.

"Aimco" Factory Horn, asked for in our June issue, was formerly manufactured by Model Instrument Co., Worcester, Mass., ("Amico"), but is now being made by Signal Engineering & Mfg. Co., 168 W. 14th St., New York, N. Y.

Replies from our readers to any of these inquiries will be greatly appreciated by ELECTRICAL MANUFACTURING, Printing Crafts Bldg., 461 Eighth Ave., New York, N. Y.

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224 E. Eleventh St.,
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200 Central Trust Bldg.,
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San Francisco, Calif.

Harry Merrithew
713 South Ervay St.,
Dallas, Texas

Radio Circuit Components—Continued
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Micrograd. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill. (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See Amsco Products, Inc.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol. See Wireless Radio Corp.
Paragon Elec. Corp., 200 Varick, New York, N. Y.
Perry Wire Works, 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See DeJur Products Co.
Radio Circuit Components—Continued
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., Waukegan, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radio File. See Pacent Elec. Co.
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiotat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Recto Mfg. Co., 23 W. Third, Cincinnati, O.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Sonatron Tube Co., Chicago, Ill. (Resistance Coupled Amplifier).
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Tandem. See Bremer-Tully Mfg. Co.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Thorola. See Reichman Co.
Tobe Deutschman Co., Cambridge, Mass.
Tone Control. See Sprague Specialties Co.
Toroid. See All American Mohawk Corp.
Torostyle. See Bremer-Tully Mfg. Co.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tune Rite. See Radiall Co.
Turn-It Radio Sales, 71 Murray, New York, N. Y.
Tuway. See Carter Radio Corp.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp., 143 W. Austin Ave., Chicago, Ill.
Ultimax. See Pacent Elec. Co.
Ultra Vario. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Verni-Juster. See Brooklyn Metal Stamping Corp.
Waterbury Button Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

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Bonza. See Haydon & Haydon.
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Eureka. See Morse Co., Frank W.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Paragon Elec. Corp., 200 Varick, New York, N. Y.
Saturn Mfg. & Sales Co., 48 Beekman, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acast. See United Radio Corp.
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Bruno Radio Corp., 40 Payntar Ave., Long Island City.
Cabelug. See Jones, Howard B.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
Dejur Products Co., 191 Lafayette, New York, N. Y.
De Veau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See Amsco Products Co.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug.)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Radiall Co., 50 Franklin, New York, N. Y.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
Royalty. See Electrad, Inc.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tubestat. See Muter Co.
Union Radio Corp., 124 Sussex Ave., Newark, N. J.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Weston Elecd. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Elec. & Mfg. Co., 351 Halsey, Newark, N. J.
Cable Supply Co., 21 Union Square, New York, N. Y.
C. E. Mfg. Co., 702 Eddy, Providence, R. I.
Cleartron Vacuum Tube Co., 28 W. 44th, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Corp., 158 Summit Ave., Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Gold Seal Electrical Co., 250 Park Ave., New York, N. Y.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Perryman Electric Co., 33 W. 60th, New York, N. Y.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Schickerling Products Corp., 401 Mulberry, Newark, N. J.
Sonatron Tube Co., 108 W. Lake, Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.
Van Horne Co., 280 Center, Franklin, Ohio.

RADIO TRANSFORMERS. See Radio Circuit Components.
RADIO TUBE BASES. See Radio Molded Parts.
RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

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Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

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Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Arcturus Radio Co., 255 Sherman Ave., Newark, N. J. (Adapters.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa (Adapters).
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., Elkhart, Ind. (Adapters).
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Morse Co., Frank W., Boston, Mass.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Composition.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2998 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Armesen Electric Co., 13 Water, New York M
Arrow Elec. Co., Hartford, Conn. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. F
Delta-Star Elec. Co., 2433 Fulton, Chicago W M
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. B
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
General Elec. Co., Bridgeport, Conn. B
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Loeffelholz & Co., Milwaukee, Wis. C
NePage McKenny Co., Armour Bldg., Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio. W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 20 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
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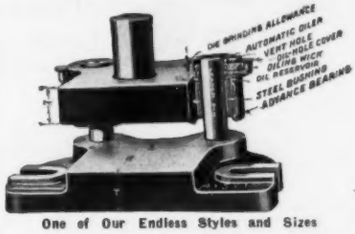

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RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

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Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite. See Raico Mfg. Co.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago Ill.
Reflectors, Porcelain Enameled—Continued
Raico Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.
REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
Allen Filter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Automatic. See Illinois Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Boyer Refrigerator Co., 2217 Locust, St. Louis, Mo.
Cameo Refrigerator Corp., 973 N. Main, Los Angeles, Cal.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dillingham Mfg. Co., Sheboygan, Wis.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gruendler Mfg. Co., Gustav J., 814 N. Broadway, St. Louis.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Co., Euclid Ave. at 65th, Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Iceless Cooler Corp., 225 N. Michigan Ave., Chicago, Ill. (Ice Cream Cabinets.)
Illinois Refrigerator Co., Morrison, Ill.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Ligonier Refrigerator Co., Ligonier, Ind.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Co., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Northey Mfg. Co., Waterloo, Iowa.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Ranney Refrigerator Co., Greenville, Mich.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.

Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

RELAYS

(See also Circuit Breakers and Thermostats.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Dunco. See Dunn, J. Struthers.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.
REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.
RHEOSTATS,
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

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Allen-Bradley Co., 493 Clinton, Milwaukee						L
Biddle, James G., 1211 Arch, Philadelphia						L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O.						L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.)		B				
Bradleystat. See Allen-Bradley Co.						
Controlite. See Ward Leonard Elec. Co.						
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill.				P		
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F	B	D			L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa.	F					
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.	F					
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
General Electric Co., Schenectady, N. Y.	F					L
Holzmuller, C. J., 1108 Howard, San Francisco, Cal.			D			
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.			D		M	
Knoeller Elec. Co., De Pere, Wis.	F					
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago	F	B	D		M	L
Robertson, Leo F., 536 W. 22nd, New York, N. Y.					M	
Schaefer Bros. Co., 1059 W. 11th, Chicago		B				
Simplicity. See Cutler-Hammer Mfg. Co.						
Union Elec. Mfg. Co., Milwaukee, Wis.	F					
Universal. See Ward Leonard Elec. Co.						
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.		B				
Vitrohm. See Ward Leonard Elec. Co.						
Ward Leonard Elec. Co., Mt. Vernon, N. Y.	F		D		M	
Watton. See Electric Products Co.						
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F				M	

RINGS Seal. See Packing.

RIVETS

Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

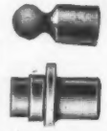
ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.



SCREW MACHINE PRODUCTS
in Brass or Steel
Send us your specifications for an estimate.
LINDEN & COMPANY
891 Broad St., Providence, R. I.

Screw Machine Products
UP TO 2¼ in. DIAMETER
OLSON MFG. CO.
56 Commerical St.
WORCESTER, MASS.

New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave. New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS

Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co. Youngstown, O.
RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge

Toycraft Rubber Co., Ashland, O.
RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.

SCRAPERS, Wire

Acme. See A. Laubscher.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Ceiuco Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis,
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston,
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 535 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.

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International Insulating service—almost as old as molding itself—far outreaches ordinary molding service at its best.

Here your molds are made for you, from your blue-prints and specifications. Here your inserts, however difficult, are easily produced — threaded, tapped, polished. Made to the exact specifications *we* require for *your* moldings, and up to us completely. Here the assembling is done *as a part of the molding operation.*

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Unity of production as its best, centralization of responsibility, elimination of tag ends. Your schedules met, your costs reduced, your product improved, made more salable. And your production stress relieved.

Your job goes into the International hopper and *keeps going.* We *must* clear our production lines *on time* under our own schedules, for the steady flow of our heavy volume of work.

The possibilities and advantages of molding are deserving of your immediate investigation. May we sit in with you and supply figures?

As good a policy today as in Washington's time

MEN who read advertisements on molding very often are men in a quandary.

Deliberation is valuable, but like the waggle in golf it can be overdone.

Many new customers find International Insulating service to be something they wish they had availed themselves of sooner. Time is so vitally in on the good things—competition so everlastingly up and doing.

You will be relieved, in such circumstances, to learn how completely you can be freed of responsibility and detail, in getting your moldings from us.

A valuable saving too in cold dollars and cents. Your entire job produced as a unit, to your specifications and meeting your delivery schedule, without the expense of assembling. Also, most likely much below previous manufacturing costs.

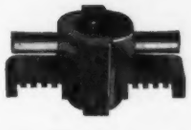
In taking off on your first venture in the use of moldings, make the beacon of International Insulating success your first objective: where great experience and the best facilities assure you a safe landing.

PRECISION MOLDERS OF BAKELITE AND SHELLAC COMPOSITION

INTERNATIONAL INSULATING CORPORATION

Division of The General Industries Co.

ESTABLISHED 1875 ELYRIA, OHIO



Collapsible radio loop base and wire bracket, molded of Bakelite in one operation, reducing cost.

A handsome oven regulator wheel in Chinese lacquer red Bakelite, improving on metal.

Ammeter and voltmeter bases of Bakelite—perfect insulation and permanent rigidity. Inserts and mold assembled in molding.

Shades—Continued
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 555 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatchford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kelton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Bent Glass Novelty Co., 54 W. Third, New York, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 230 10th Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oameo. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

Electrical SLATE

Large Stocks—Quick Deliveries. Send your Slate orders to us.

DAVIS SLATE & MFG. CO.
618 East 40th St., Chicago, Ill.

PORTLAND-MONSON SLATE CO.

PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.

Quarriers of

Monson Slate for Electrical Purposes, Natural Black, Oil Finish

Quarries: Monson, Maine

Office, Portland, Maine

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)
Waterbury Mfg. Co., Waterbury, Conn.

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weldenhoff, Joseph.
Weldenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain and Attachments

Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS

Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.
Key ..... See K
Composition ..... See W
Metal Shell ..... See B
Porcelain ..... See A
Pull Chain ..... See P
Push Through ..... See T
Sign Receptacles ..... See A

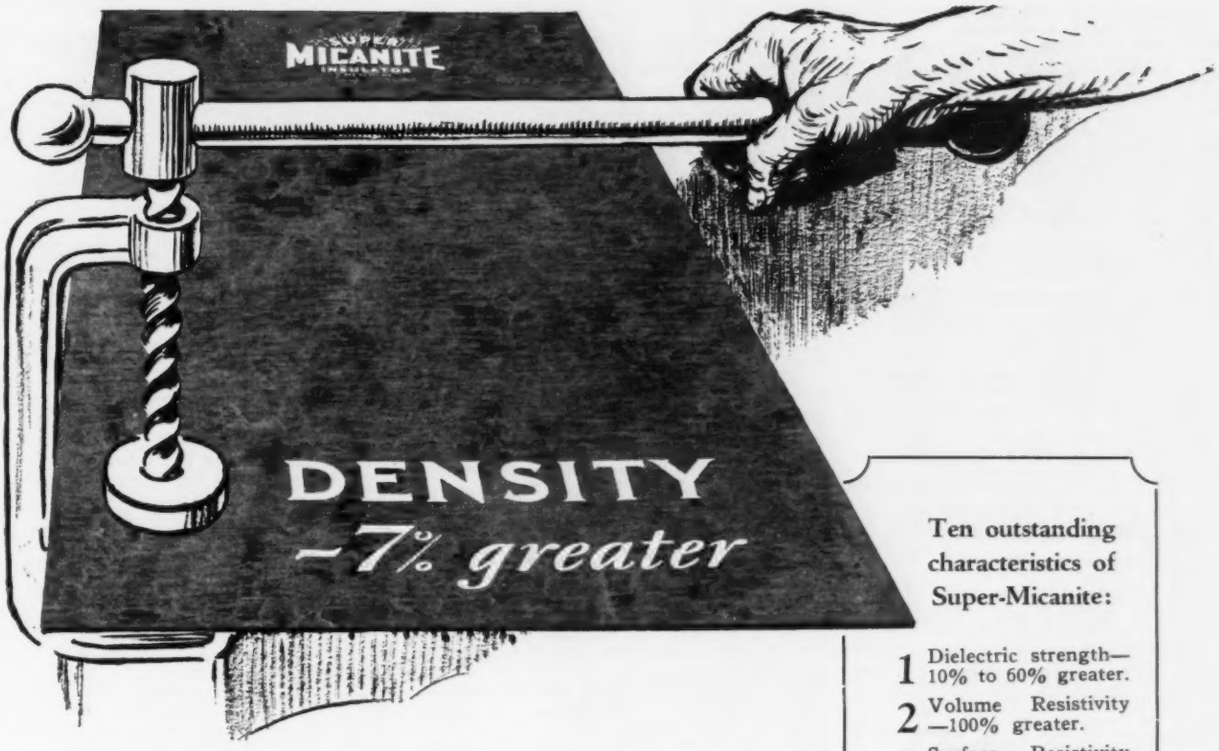
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Co., Hartford, Conn. ..... M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. ..... K .. P ...
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C .... P B ..
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M .. K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M .. K T .. B A
Crouse-Hinds Co., Syracuse, N. Y. .. A W .....
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T .. B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B ..
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 230 10th Ave., New York, N. Y. ..... M C ..... B ..
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Bridgeport, Conn. ... M C K T P B A
Glow Elec. Co., 22 Queens, Long Island City, N. Y. ..... M ..... B ..
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... M C K T P B A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Meteor Elec. Corp., 499 E. 76th, New York, N. Y. ..... K .. P ...
Molded Socket Corp., Railroad, Pa. .... K .....
Multi Elec'l Mfg. Co., 210 N. Ogden Ave., Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. ..... M ..... P B ..
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y. (Candle.) ..... T .. B ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y. .....
Royal. See Sears, Henry D.
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 50 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
TEC. See Electric Company.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P .. B .. W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Walco. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B ..
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P ....
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6756 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.

Fair Haven Marble & Marbleized Slate Co. **SLATE**

Fair Haven Vermont **GOODS**



MORE mica per pound of insulation—greater insulating value—two Super-Micanite characteristics that are of particular interest to motor manufacturers and repairmen. They make for easier commutator assembly, uniform segment spacing and better, more dependable motors.

In addition Super-Micanite is unaffected by heat such as is developed in soldering leads to commutators. Arcing and excessive heating does not carbonize the binder, and cannot produce corrosive decomposition products, for the binder is a synthetic cement.

These practical advantages are responsible for the ever-increasing demand for Super-Micanite, not only for motor segments and rings, but for heater plates, bushings, tubes, conduits and similar electrical insulation services.

Bulletin 111 describes some of the many interesting applications of Super-Micanite. A copy, together with a test sheet of Super-Micanite, will gladly be sent upon request.

MICA INSULATOR COMPANY

World's Largest Manufacturers of Mica Insulation

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Cleveland Pittsburgh Cincinnati San Francisco Los Angeles Seattle
Toronto, Canada Works: Schenectady, N. Y. London, England

Ten outstanding characteristics of Super-Micanite:

1. Dielectric strength—10% to 60% greater.
2. Volume Resistivity—100% greater.
3. Surface Resistivity 300% greater.
4. Dielectric Power Loss—34% less.
5. Slippage — shows practically none under pressure.
6. Transverse strength—50% to 100% greater.
7. *Density 7% greater*
8. Carbonization — its binder shows only *slight* tendency to carbonize under high temperatures and when exposed to arcing.
9. Corrosion — Is non-corrosive to copper. Its binder decomposes at a *higher* temperature and the decomposition products, formed below the carbonization point, are *neither corrosive nor conductive.*
10. Effective of heat — slight.

All tests are conducted in accordance with the standards of the American Society for Testing Materials.

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Solder, Aluminum—Continued
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire
Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing
American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver
Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING
Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS
Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Blue Seal Chemical Co., 126 Locust, Roselle, N. J.
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brunner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Letellier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulting Co., 5716 Euclid Ave., Cleveland, O.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammonica.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Radens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co
Solderall Co., 129 Sussex Ave., Newark, N. J.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co
Superior. See Highland Electro Chemical Co.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tisit. See Letellier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS
Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 116 1st Ave. N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.

Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Variek Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Variek, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator
(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SOLENOIDS. See Coils

SPAGHETTI. See Tubing, Varnished Fabric.

SPEED CHANGING UNITS. See Gears (Speed Changing Units).

SPEED INDICATORS. See Tachometers.

SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYERS, Electric
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Little Brown Jug, Inc., Reading, Pa.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago,
Presto. See Metal Specialties Mfg. Co.
Sprayit. See Electric Sprayit Co.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,
Advance Spring & Wire Co., 1749 Carroll Ave., Chicago,
American Spring & Mfg. Co. 212 Elm, Detroit, Mich.
Cary Spring Works, Inc., 240 W. 20th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Farrington & Co., 28 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel
Heavy Stamping and Drawing.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small
Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee,
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Plano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.

Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Corp., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet
Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS
Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Mansfield Sheet & Tin Plate Co., Mansfield, Ohio.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Trumbull Steel Co., Warren, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers
Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator
Acme. See Green Equipment Corp.
Carr. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL
Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.

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For Soldering Nickel Chromium Alloys
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Manchester Depot, Vermont

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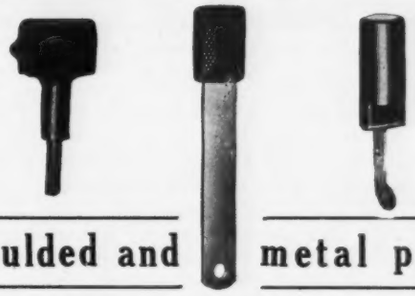

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Also *special turned and custom moulded parts* to your specifications.

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South Manchester, Conn.

Switch (Switches)—Continued
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
M. D. Co. See Mechanical Devices Co.
Mechanical Devices Co., Aurora, Ill.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L, Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 291 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 144 Bleeker, Newark,
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.

Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.	f					
Anylite Elec. Co., Ft. Wayne, Ind.					L	
Arrow Electric Company, Hartford, Conn.	f	sp	P	R	L	F
Arrow Head. See Arrow Elec. Co.						
Beaver Mfg. Co., 625 N. Third, Newark, N. J.	f	p	P			F
Best. See United States Elec. Mfg. Corp.						
Brascolite. See Guth & Co., Edwin.						
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f					
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.					L	F
Bryant Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F
B. S. Co. See Bridgeport Switch Co.						
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.						F
Circle F. Mfg. Co., Trenton, N. J.	f		P		L	F
Circle T. See Trumbull Elec. Mfg. Co.						
Connecticut Elec. Mfg. Co., Bridgeport, Conn.		p	P	R	L	F
Crouse-Hinds Co., Syracuse, N. Y.					L	
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.		P			L	
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.				R		
Diamond H. See Hart Mfg. Co.						
Dugle. See Bryant Elec. Co.						
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.						F
Gaynor Elec. Co., Bridgeport, Conn.	f					
General Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F
Glo-Guide. See Bryant Elec. Co.						
Gold Star Push Switch. See Hart & Hegeman.						
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.						F
Hart Mfg. Co., Hartford, Conn.	f	sp	P	R	L	
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.)	f	sp	P	R	L	F
Hart. See Hart & Hegeman Mfg. Co.						
H. & H. See Hart & Hegeman Mfg. Co.						
Hubbell, Harvey, Inc., Bridgeport, Conn.		sp			L	F
Jost. See Morse, Frank W.						
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.	f		P			
Leviton Mfg. Co., 226 Newell, Brooklyn						F
Levolier. See McGill Mfg. Co.						
McGill Mfg. Co., Valparaiso, Ind.	f				L	F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.					L	F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y.	s			R		
Morse Co., Frank W., 291 Congress, Boston, Mass.			P			
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill.					L	F
National. See Standard Elec. Mfg. Co.						
New England. See Paulding, John L.						
Nutmeg. See Hubbell, Harvey, Inc.						
Operite. See Morse Co., Frank W.						
Pass & Seymour, Solvay Sta., Syracuse, N. Y.	f	sp	P		L	F
Paulding, John I, New Bedford, Mass.	f	s	P			
Pen Tap. See Beaver Mfg. Co.						
Perkins. See Bryant Elec. Co.						
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y.					L	
Pilotoggle. See Pilot Elec. Mfg. Co.						
Pullrite. See Morse, Frank W.						
Roberts Elec. Mfg. Co., 2.2 Centre, New York, N. Y.						F
Rodale Mfg. Co., 200 Hudson, New York	p					
Sears, Henry D., 80 Boylston, Boston	f	sp	P	R	L	F
Sho-Lite, Inc., Dept. R, 141 Merrimac, Boston, Mass. (Pilot Light.)	f					
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.			P			
Snapit. See Marks Products Co.						
Spartan. See Bryant Elec. Co.						
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill.	f	s	P	R	L	
Trigle. See Bryant Elec. Co.						
Trumbull Elec. Mfg. Co., Plainville, Conn.	f	s	P	R	L	
Twi-Lite. See McGill Mfg. Co.						
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y.	f					
Victor. See Keil & Son, Francis.						
Weber. See Sears, Henry D.						
Wood Electric Co., C. D., 565 Broadway, New York, N. Y.						F
Workrite. See Morse, Frank W.						

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.

Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank

Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Outrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Penn Elec. Switch Co., 306 Twelfth, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilboken Mfg. Co., 404 Grove, Milwaukee, Wis.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Cleveland. See D. J. Time Switch Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
D-J Time Switch Co., 1306 E. 14th, Cleveland, O.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Sauter. See Cramer & Co.
Stutz Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elect. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville, Inc., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Webbing Co., Nye, Pawtucket, R. I. (Cotton, Silk.)
Awelco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beledentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.
Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Guscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.

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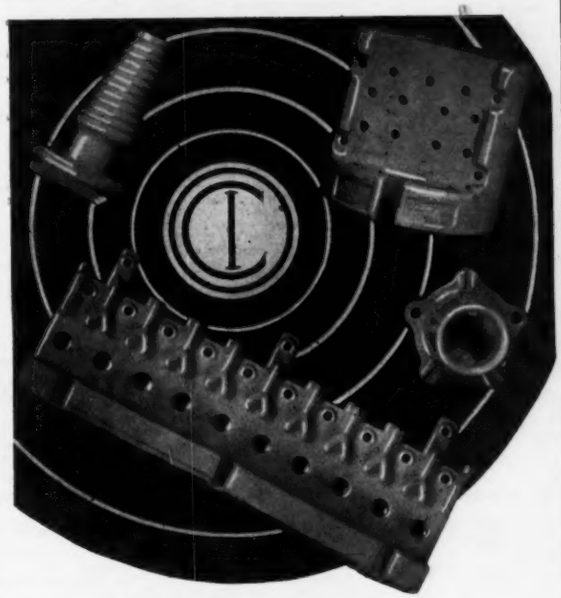

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Tape, Rubber & Friction—Continued

Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okonite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Gripltite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville, Inc., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co
Security. See United States Rubber Co.
Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticks. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., Dept. ER4, 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Fleron & Son, M. M., 113 N. Broad, Trenton, N. J.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kuller Elec. Mfg. Co.
Kuller Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. D., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 N. Capitol, Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments

Ace. See Weidenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., G Dept., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland.
Electric Machine Corp., 529 N. Capital, Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 372 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Servwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Briggs & Sons Co., J. Providence, R. I.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Leachwood Co., Janesville, Wis.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Savutime Devices, Inc., 68 Manhattan, Rochester, N. Y.
Sensatherm. See Mercoid Corp.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermosnap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TIPS, Cord

Alden Mfg. Co., Brockton, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Saunton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 1638 S. Wabash Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., 1823 Wyandotte, Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.

TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS

Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage

Sorgel Elec. Co., 89 W. Water, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition

For Oil Burners and Gas Tube Signs.
American Bosch Magneto Corp., Springfield, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago,
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elec'l. Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power

Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.

TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.

TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Straw Co., 28 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

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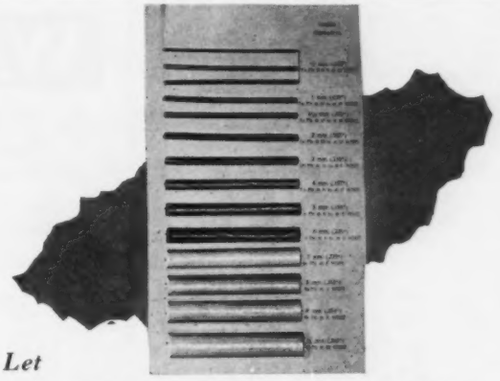

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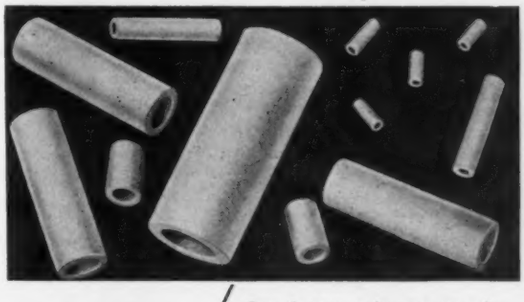

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TUBING, Flexible Metallic

Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Coit St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose & Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Leachwood Co., Janesville, Wis.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.
TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.
UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. B, 1217 Washington, Boston.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1505 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2698 E 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 28 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Wittlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hexwound. See Monitor Controller Co.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Ironlum Products Co., 112 Hamilton, Cleveland, O.
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 61 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Simplex Electric Heating Co., 85 Sidney, Cambridge, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag Elec. Co., 5100 W. Ravenswood Ave., Chicago.

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Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.
VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-33rd St., Brooklyn, N. Y
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.
WASHERS, FIBRE. See Fibre.

WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock

Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 212 W. Grand Ave., Chicago, Ill.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.
WATTMETERS. See Instruments.

WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.... S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S ..
Clifton Mfg. Co., 65 Brookside Ave., Boston.... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. .... W S ..
Dielectric Mfg. Co., St. Louis, Mo. .... W .. C
Dolph Co., John C., 168 Emmet, Newark, N. J. W ....
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn. .... W ....
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. .... W S ..
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich. .... W ....
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York. .... W ....
Leorite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. .... W ....
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W ....
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. .... W ....
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. .... W ....

Sherwin-Williams Co., Cleveland, O. .... W .. C
Standard Varnish Wks., 433 4th Av., New York.. W .. ..
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. .... W S ..
Star Porcelain Co., Trenton, N. J. .... W .. C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. .... W S ..
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. .... S ..
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y. .... W .. ..
WELDS, Lamp Lead-in. See Filaments, Incandescent Lamp.

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Ry. Improvement Co., 2070 E. 61st, Cleveland, O.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fuzon Welding Corp., 103rd St. & Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., Fort & Mt. Elliott, Detroit, Mich.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron, Chicago, Ill.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.
WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.
WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Ridlon Company, Frank, 253 A St., Boston, Mass.
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 136 Seventh, Jersey City, N. J.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Weehawken Elec. & Mfg. Co., 343 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6162 West 65th St., Chicago, Ill.
WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.

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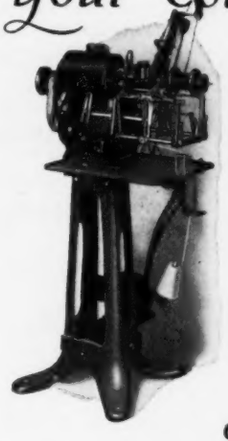

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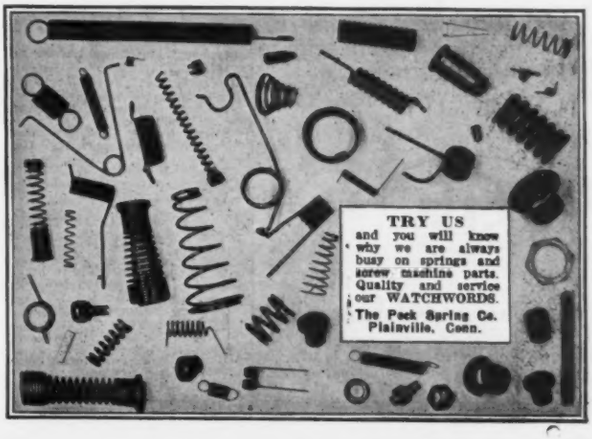
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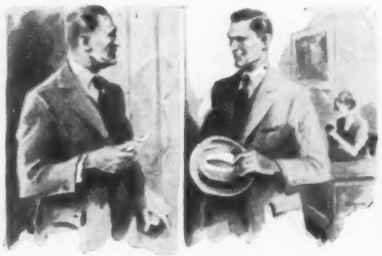

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Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding ..... See S
Copper Wire ..... See C
Iron Wire ..... See S
Phosphor Bronze ..... See B
Radio Bus Wire ..... See C
Resistance Wire ..... See R
Steel Wire ..... See S

Acme Wire Co., New Haven, Conn. ..... C . . . .
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C R . .
American Brass Co., 25 Broadway, New York,
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R . .
American Electrical Works (Phillipsdale), Providence, R. I. ..... C . . . .
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C . . S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C . . S
Anaconda. See American Brass Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C . . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago C . . S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. .... R . .
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. ..... C . . . .
Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C . . . .
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C . . S
Cornish Wire Co., 30 Church, New York, N. Y.. C . . . .
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C . . . .
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 101 Bradford, Providence, R. I. C . . . .
Detroit Insulated Wire Co., Detroit, Mich. ..... C . . . .
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. .... R . .
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.. . . . . .
Gilby Wire Co., Riverside Ave., Newark, N. J.... . . R . .
Goldmark Co., James, 83 Warren, New York.. C . . . .
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C . . . .
Hoskins Mfg. Co., Detroit, Mich. .... R . .
Hudson Wire Co., Ossining, N. Y. ..... C R . .
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C . . S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Inland Wire & Cable Co., Sycamore, Ill. ..... C . . . .
Ironlum Products Co., 112 Hamilton, Cleveland, O. . . R . .
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucerp. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C . . . .
Monarch Elec. & Wire Co., 622 W. Adams, Chicago C . . S
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark.. . . R . .
Nehring Electrical Works, De Kalb, Ill. ..... C . . . .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. .... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. ..... C . . . .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C . . . .
Race. See Ross Wire Co.
Roebling's Sons Co., John A., Trenton, N. J..... C . . S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C . . . .
Ross Wire Co., 69 Bath, Providence, R. I..... C . . . .
Silcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. ..... C . . . .
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C . . . .
Super-Insulated Wire Co., Plymouth, Mass. ..... C . . . .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C . . . .

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

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WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire....	See A
Asbestos Covered Heater Cord.....	See H
Asbestos Covered Magnet Wire....	See M
Enameled Magnet Wire	See M
Fixture Wire	See R
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See R
Magnet Wire	See M
Rubber Covered Wire & Cable..	See R
Stove Wire	See H
Telephone Cord	See T

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A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn. Enamaled Silk, Cotton .... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. ..... A . . M . .
American Copper Products Corp., 233 Broadway, New York, N. Y. ....
American Electrical Works (Phillipsdale), Providence, R. I. .... M
American Enameled Magnet Wire Co., Muskegon, Mich. .... M
American Insulated Wire & Cable Co., 954 W. 21st, Chicago, Ill. .... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F . . A T . .
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled..... . . . . A . . M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R . . . . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F . . . . . .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H . . . . .
Bradford, Kyle & Co., Plymouth, Mass. . . . . M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H . . . . .
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R . . . . . .
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 101 Bradford, Providence, R. I. ..... R . . . . . .
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T . .
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R . . . . . T . .
Diamond Braiding Mills, Chicago Heights R F H . . . . .
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R . . H . . . . .
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. . . . . M
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R . . . . . .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. .... F . . . . . .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. . . . . T . .
General Asbestos & Rubber Co., Charleston, S. C. .... H . . . . .
General Elec. Co., Bridgeport, Conn.... R F H . . . M
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet .... A . . M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R . . . . . T . .
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y. ..... R . . . . . .
Hatfield Rubber Wks., Inc., Hillside, N. J. R . . H . . . . .
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. R F . . A . . . . M
Hercules Powder Co., Wilmington, Del.. . . . . A . . M
Holyoke Co., 621 Broadway, New York.. R . . . A . . M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H . . . . .
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R . . . . . T M
Kilo, Co., 2 E. 23d, New York..... . . . . . T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. .... T . .
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H . . . . .
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass..... R . . . . . T . .
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled .... M
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T . .

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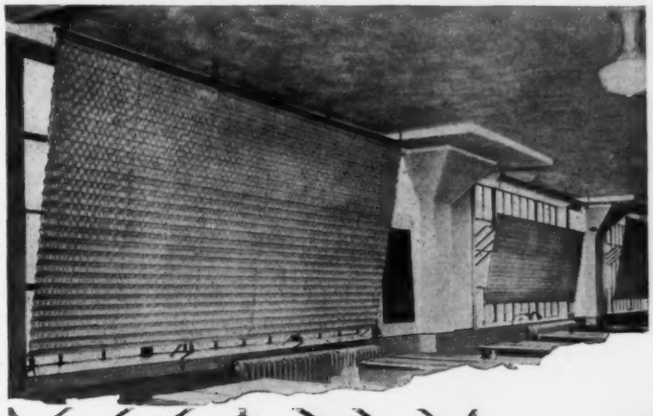

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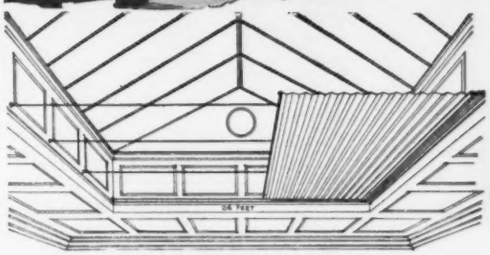

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Massachusetts Elec. Mfg. Co., West Lynn, Mass. ..... M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill. ..... A
Montgomery Co., J. R., Windsor Locks, Conn. ..... T
National India Rubber. See U. S.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. ..... R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass. ..... R H T
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J. ..... R
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O. ..... R F
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. ..... H A T
Phillips Wire Co., Pawtucket, R. I. ..... R
Providence Insulated Wire Co., Providence, R. I. ..... R F H A
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. ..... R H T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. ..... M
Rome Wire Co., Rome, N. Y. ..... R F H T M
Ross Wire Co., 69 Bath, Providence, R. I. ..... R
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. ..... T
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H
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Seward Wire Co., Parkersburg, W. Va. ..... R
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F
Shield. See Ansonia Elec'l Co.
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. ..... H
Standard Insulated Wire Co., Westfield, Mass. ..... R H
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) ..... R F H A T
Sterling. See Standard Underground.
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Strand & Sweet Mfg. Co., Winsted, Conn. ..... M
Super-Insulated Wire Co., Plymouth, Mass. ..... M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.

Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn ..... R
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F
United States Rubber Co., 1790 Broadway, New York, N. Y. ..... R H A T
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. ..... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H T
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y. ..... R H M

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American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

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(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines ..... See A
Braiding Machines ..... See B
Bunching Machines ..... See S
Covering Machines ..... See I
Insulating Machines ..... See I
Insulation Straining Machines ..... See I
Measuring Machines ..... See M
Park Cabling Machines ..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

Adamson Machine Co., Akron, Ohio ..... I A
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. ..... I A S U F
Breguet. See American Insulating Machy.
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 602 Buffum, Milwaukee, Wis. ..... M U
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I U
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. ..... M U
Nebuttco. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I
Sleeper & Hartley, Inc., Worcester, Mass. ..... A S U
Terkelson Machine Co., 326 A St., Boston, Mass. ..... M
Textile Machine Works, Reading, Pa. ..... B
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. ..... A U F
Utility Mfg. Co., Cudahy, Wis. I
Wardwell Braiding Machine Co., Central Falls, R. I. ..... B
Wire Machinery Corp. of Am., New Haven, Conn. ..... M S U
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers, Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.
WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.
WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

YARN AND THREAD; Silk, Cotton, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville, Inc., New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd. Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co., 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeles Zinc Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.

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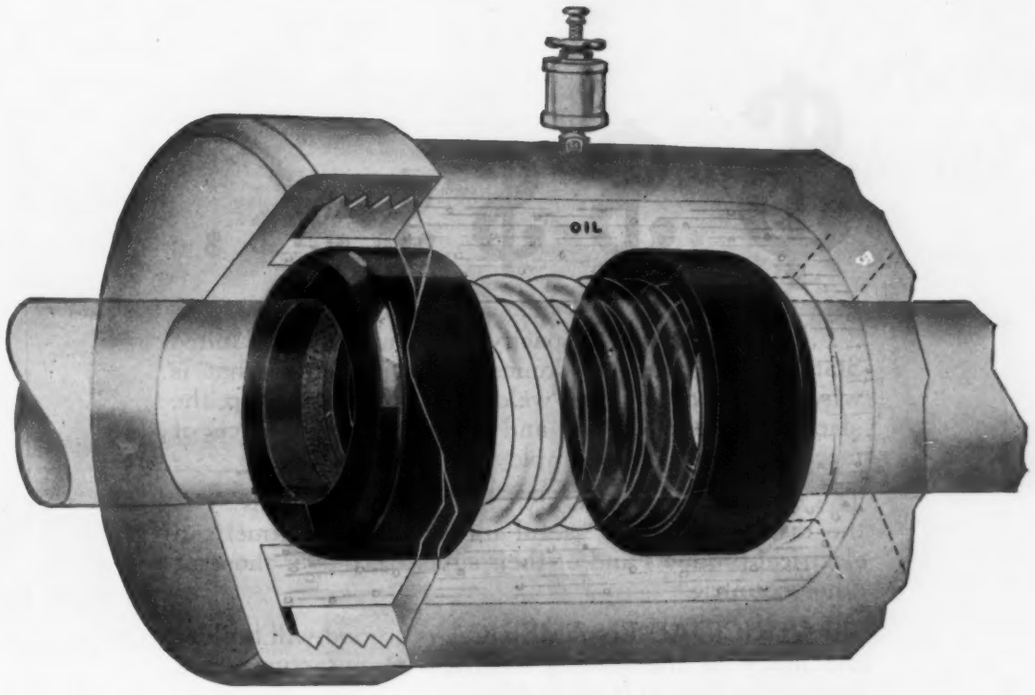

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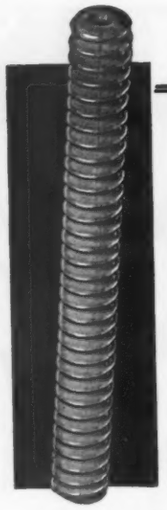

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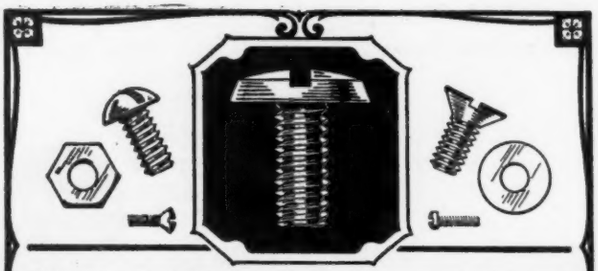

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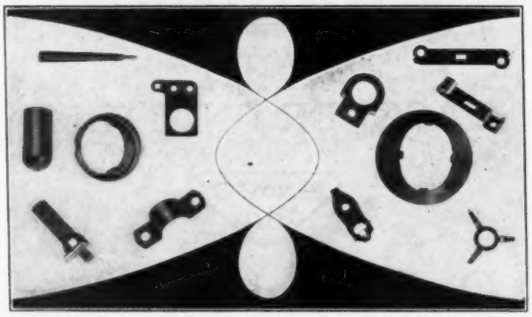

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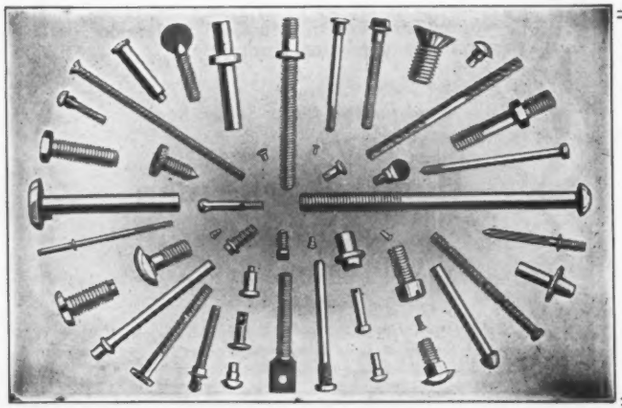

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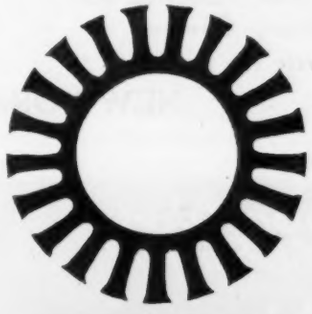

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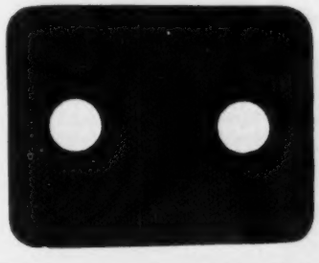

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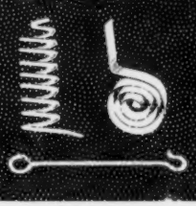

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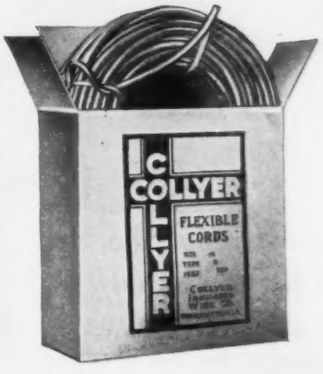

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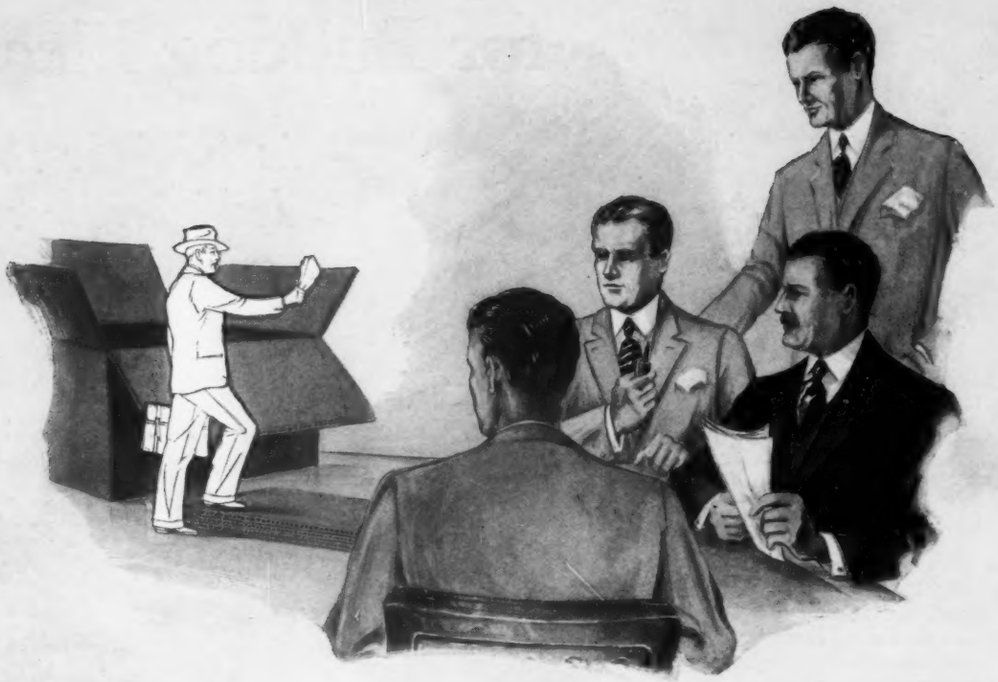

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